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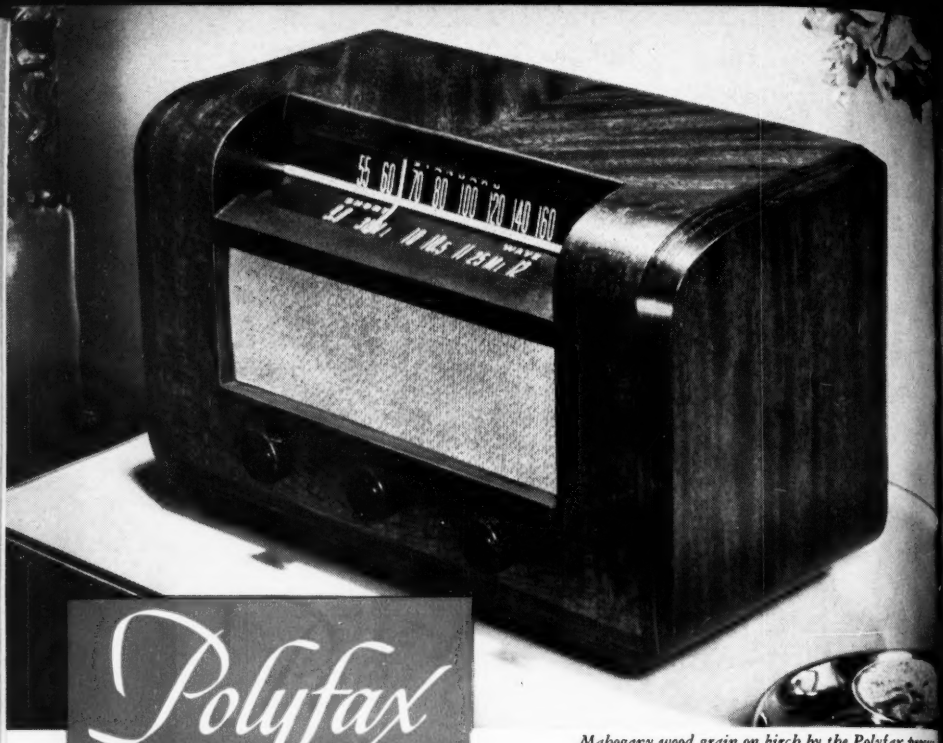

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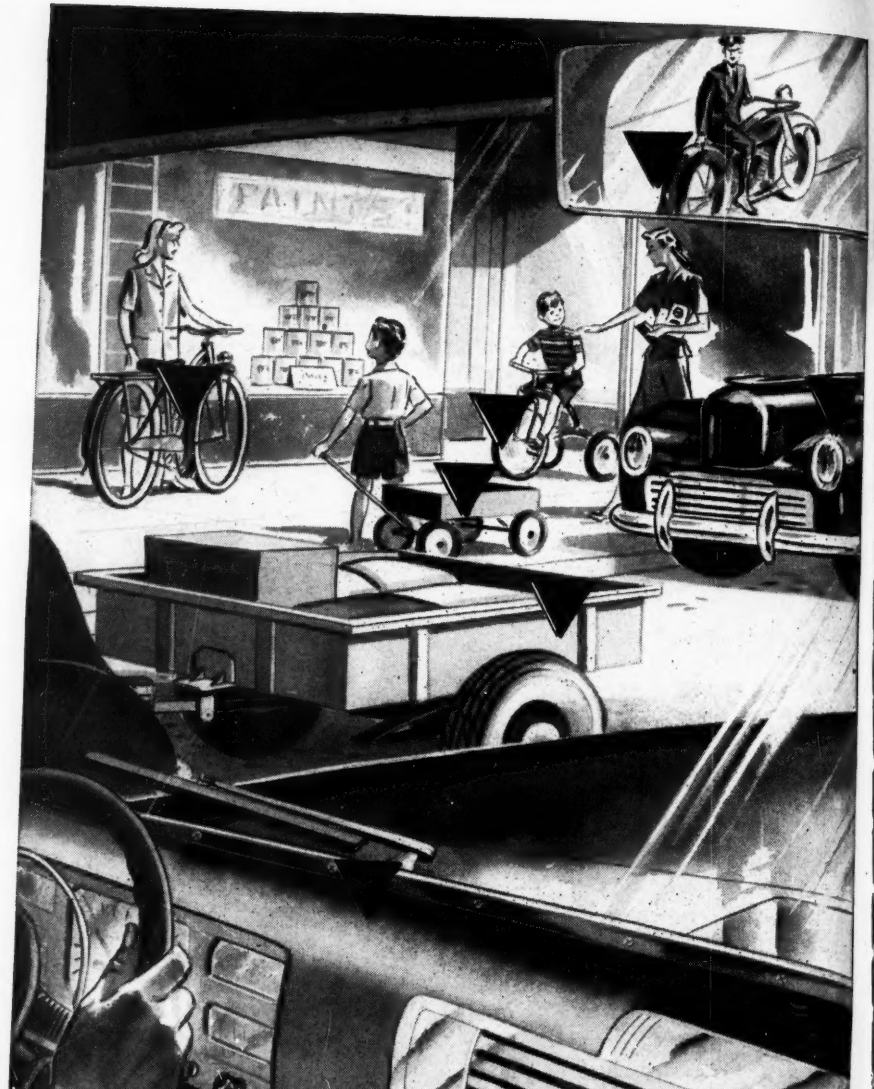

PAINTS

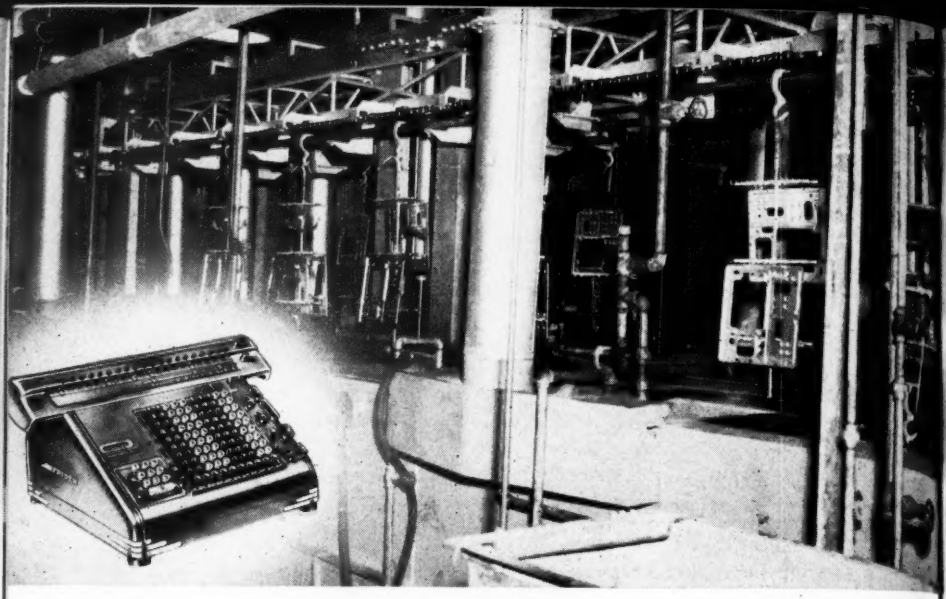
Products Finishing

Qualified Testing Aids Selections

MANY examples can be cited in the metal-finishing industry of the improved service performance that is obtainable through the *proper* selection of protective coatings. In the determination of the suitability of a protective coating, there are many tests that may be employed. Some of these consist of exposure of the coating to accelerated environmental conditions, and others of physical tests on the coating. Oftentimes, it is found that some of these tests can best be made on a comparative basis, since testing conditions may not be reproducible or the results may not lend themeselves to numerical evaluation.

Corrosion tests consist of the exposure of suitable specimens to various environments and determining the point at which attack upon the base metal begins or reaches a maximum allowable level. These tests may take the form of outdoor atmospheric exposure of the specimen, immersion in sea water or chemical solutions, or burial in the soil. Salt fog chambers, humidity rooms and cabinets, and "weathering machines" are equipment commonly used for accelerated tests. Frequently, it is desirable to vary the thickness or combination of coatings as a means of determining rates of deterioration. Many of the physical tests on organic coatings are for the purpose of providing evaluation of properties related to the adherence of the coating to the base metal and such factors as its distensibility, abrasion resistance, hardness, and resistance to scratching or mar.

One important fact that should be accepted and given due consideration is that organic coating tests should be conducted under conditions as nearly identical with the actual use as possible. This procedure will require that special attention be paid to such factors as choice of test panel material, surface preparation of test panel, method of application of finish and drying procedure employed, and thickness of film used. The finishing engineer in charge of testing should see that these factors are selected to be as close to actual service conditions as possible.



Full Automatic Cadmium Plating at Friden

Loading conveyor combined with full automatic plating machine enables Friden Calculating Machine Company to cadmium plate 8,000 small parts per hour.

By J. DeLAMAR HARRELL

FRIDEN calculators are composed of several thousand small precision parts of which 98 per cent must be treated anti-corrosively. The unprecedented demand for calculators, backed up from the war years, required the development of some method of mass production plating of parts before finished machines could be turned out in the quotas planned by the company. To solve this problem, a Udylite plating machine, as shown in Fig. 1, was installed under the supervision of Fred Shear, head of Friden's finishing department. The enlarged plant's daily requirements for cadmium plated parts can now be met easily.

Untreated parts converge on a table over which an endless chain conveyor travels. As illustrated in Fig. 2, loaders hang the small parts on specially designed racks, which hold up to 79 small parts, depending on the size. The

(Above) Fig. 1—View of the Udylite plating machine which the Friden Company uses to cadmium plate small parts for calculating machines

racks travel on the conveyor to the entrance of the plating machine where they are transferred from the loading conveyor to the automatic plating machine by the plater. Figure 3 provides a view of this transfer point.

The Udylite plating machine comprises a series of vats or tanks arranged rectangularly in two rows over which an endless chain conveyor operates. Movement of parts in process from one tank to another through the plating operation is accomplished by means of the chain conveyor. Racks of parts being plated are supported in the various solution tanks on bars which are raised and lowered by a central hydraulic cylinder controlled by solenoids. The time that the parts remain in the individual baths is predetermined and controlled by a Micro-flex timer. The entire plating process, including the loading and unloading of the racks, takes place in slightly less than 30 minutes.

Power for the plating machine is supplied by two generators; a 2,000-ampere 6-volt Hanson-Van Winkle-Munning generator is connected to the main plating tanks and a 1,000-ampere 6-volt H-VW-M generator connected to the cleaning tanks. The conventional panel board containing ammeter, voltmeter, rheostat, and starting switch is provided for each motor generator set, as illustrated in Fig. 4. An electrical control panel designed to provide the operator complete control of the plating machine at all times is fitted with ammeters and voltmeters on all direct current circuits, dials to indicate cleaning tank temperatures, a pressure gage for the hydraulic line, Micro-flex timer, and on-and-off switches for all motors. The gages and instruments supplied by the Udylite Company were installed on the control board according to specifications set up by Friden's engineers. Automatic temperature control equipment provides constant controlled bath temperatures so that maximum efficiency of all solutions may be obtained.

After the racks of unplated parts are loaded on the plating machine, they are conveyed through a trichlorethylene vapor bath which thoroughly degreases each part. The racks then move along the conveyor to a cleaning tank where they are given an 83-second cathodic electrocleaning, followed by an anodic electrocleaning in a similar adjoining tank. These cleaning

Fig. 2 — This illustration shows how the transport conveyor travels over the loading and unloading table. Operator at the left is loading untreated parts on the racks which will be removed by the plater and transferred to the Udylite plating machine. The two operators at the right are unloading, inspecting, and stacking the finished parts.

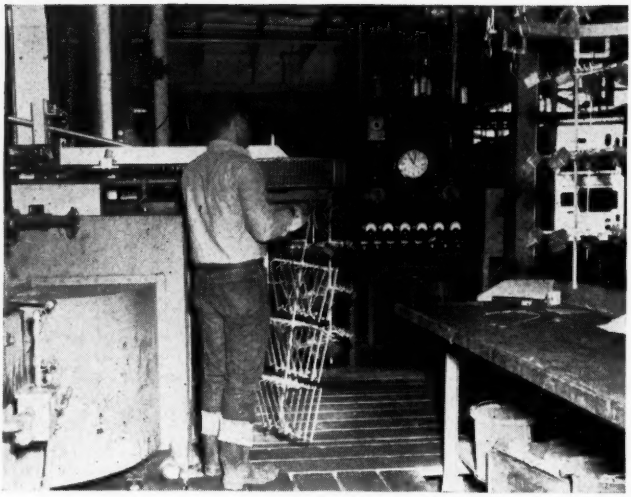


Fig. 3 — Plater is shown transferring racks of parts from the transport conveyor to the Udylite automatic plating machine. Pictured also is the control panel (right center background). The plater can determine tank temperatures and amperages by glancing at the control panel and stop the entire mechanism quickly if necessary.

tanks contain 5 ounces per gallon of Oakite 90 and are operated at 200 deg. Fahrenheit.

The parts are then rinsed in a combination dip and spray rinse tank. This operation is accomplished in a 3-foot tank and requires 11 seconds. Parts in process are next dipped in a 50 per cent solution of hydrochloric acid for 47 seconds after which they are given another dip and spray rinse.

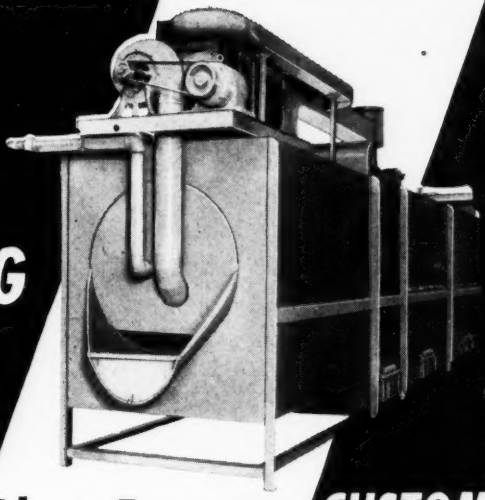
Following this rinse, the parts are transferred to the cadmium plating tank and given a 513-second cadmium plate at a current density of 25 amperes per square foot with a voltage of 3 to 3½ volts. These conditions produce a cadmium plate varying in thickness from 0.0015 to 0.0003 inch, depending upon the shape of the parts and the relative position of the parts with respect to the anodes. The cadmium plating solution contains 3 to 4½ ounces per gallon of cadmium, 2 to 5 ounces per gallon of sodium hydroxide, and 9 to 13 ounces per gallon of sodium cyanide. The temperature is maintained between 80 and 90 deg. F. Solution composition is controlled by additions of cadmium oxide and sodium cynaide.

After the parts emerge from the cadmium plating tank, they are processed through a rinse tank which is also used as a cadmium solution concentration tank. Solution from this tank is returned to the cadmium plating tank to replace solution lost by dragout and evaporation.

A routine rinse and spray followed by an 11-second chromic acid bright dip in a solution composed of 9.5 ounces per gallon of chromic acid and 0.16 ounce per gallon of sulphuric acid is the next step in the cycle.

Following another spray rinse, the parts are submerged in a hot water rinse for 47 seconds at 210 deg. F. in order to heat the metal and provide for rapid drying. In the final step in the process, the parts are dried in 155 seconds by a forced circulation of hot air secured by forcing air past a steam radiator.

After emerging from the drying tank, the racks of brightly gleaming parts are transferred from the plating machine to the transport conveyor traveling over the loading and unloading table. The parts are then taken from the racks, inspected, stacked in special parts containers, and moved to stockroom or assembly lines.



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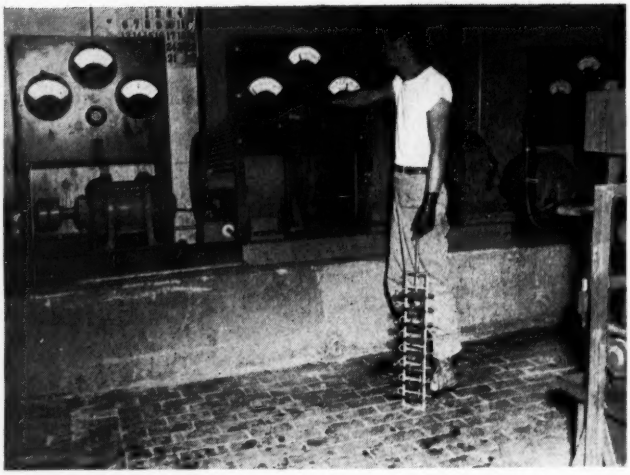

Fig. 4 — This illustration shows generators and panel boards used in connection with the Udylite automatic plating machine.

As in the case in any large scale plating operation, adequate facilities must be available for constant checking, testing, and analyzing. In order to keep plated parts rolling to assembly lines in such large numbers, Friden maintains a fully equipped metallurgical and chemical laboratory. This laboratory has the necessary equipment for checking and controlling every solution used in the plating process. The strength of the hydrochloric acid dip is checked by specific gravity. A Beckman pH meter is used to determine the pH of the cadmium plating tank, which is held between 12.40 and 13.20. Cadmium metal analysis is made by the potassium ferrocyanide method and a Fisher electro analyzer is used to check the standard cadmium solution. Thickness of the cadmium metal deposit is determined with a Kocour drop-testing set and the corrosion resistance of the plated parts is tested in a salt spray apparatus. The salt spray test is made in accordance with specifications which require that the parts withstand a spray of 20 per cent salt solution at a temperature of 95 deg. F. for 500 hours.

•

The effectiveness of this fully automatic plating process employed in the Friden plant at San Leandro, California seems to have been conclusively demonstrated by the satisfactory performance of the Friden calculator under all types of climatic conditions in all sections of the world.

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"Tuf-On Aluminum Paints" is the title of a six-page profusely illustrated bulletin issued by the Brooklyn Varnish Manufacturing Co., 50 Jay St., Brooklyn 1, N. Y. Various applications for which aluminum paints may be used are suggested in the bulletin and a handy selector chart is included to aid in selecting the proper grade of aluminum paint to provide maximum satisfaction in each application. Copy free upon request.

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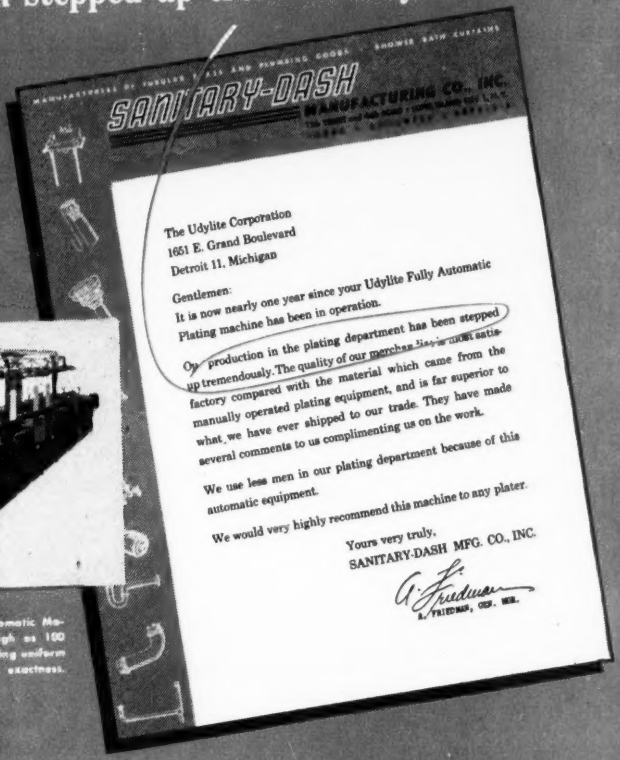
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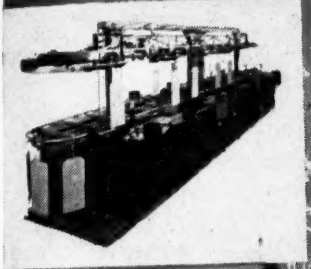

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DIE CASTINGS *Must be clean*

I.

A Compendium of Cleaning Cycles Proved in Present-Day Production Practice

By ARTHUR P. SCHULZE

PF FEATURE

In recent years, and across the past decade particularly, discussions devoted to the finishing of die casting alloys — especially zinc, aluminum, and magnesium— have assumed greater and greater prominence in product-coating literature. As a result, "volumes" already have been written, covering nearly every aspect of the subject from "A to Z." Yet despite this extensive exploration editorially, the topic comprises one that continues to command keen attention from finishing department superintendents, shop foremen and independent coating operators.

Back of this widespread interest, aside from the natural desire on the part of most production-finishing men to establish higher standards of coating performance, efficiency and economy lies a lode rich in sound reasons. Of these, one of the first and foremost is as follows: because die casting provides such advantages as design accuracy, close tolerance, volume output at production-line speed, and mass-manufacturing cost and its consequent adaptability to a diverse range of industrial and consumer product applications, this fabricating technique has developed swiftly in keeping pace with ever-growing demands.

This article is the first of a series of three dealing with the surface preparation of die castings. The remaining articles in the series will be published in succeeding issues of PRODUCTS FINISHING. It is believed that this series of articles will be valuable as future reference material.

A second basic factor is that most die castings are surface-processed by one or another type of treatment— plating, painting, lacquering, enameling, anodizing, chemical coating, and so on. In fact, so one authority asserts,

well over 50 per cent of die cast products or assembled components receive some type of surface finish, applied for a variety of purposes; namely, (1) corrosion resistance and surface protection, (2) additional utility and increased wearability, (3) appearance, decorative effect and color, and (4) visual attraction and sales appeal.[1]

Add to these fundamental facts three additional considerations, among others holding equal importance—increased consumption of lacquered and enameled zinc alloy die castings,[2] mushroomed wartime expansion of light metal alloys[3] which require some form of finishing for many applications to serve the dual purpose of increasing corrosion resistance and augmenting surface appearance,[4] and unusual development of organic coating materials, methods and equipment originally designed to meet war demands and overcome critical material shortages.[5] It is little wonder, then, that the application of chemical and electrochemical finishes to die castings remains a subject of avid interest to all product-coating operators.

Whenever talk turns to the subject of finishing, discussion inevitably leads to the corollary topic of surface preparation, cleaning. As all experienced production men know so well, the two factors, obviously, are inseparably linked, for the effectiveness and adequacy of one govern in large measure the adhesion and durability of the other. At the very outset, too much emphasis cannot be placed on the indisputable fact that regardless of whether the finish is applied for protective purposes or decorative reasons—and no matter what type of coating is applied—proper preliminary treatment or surface preparation constitutes a universal requirement of paramount importance.

On this point countless authorities and observers are in unanimous agreement. One need not search far into technical literature to find incontrovertible substantiation of the assertion that thorough cleaning is a vital requisite to successful finishing. Below

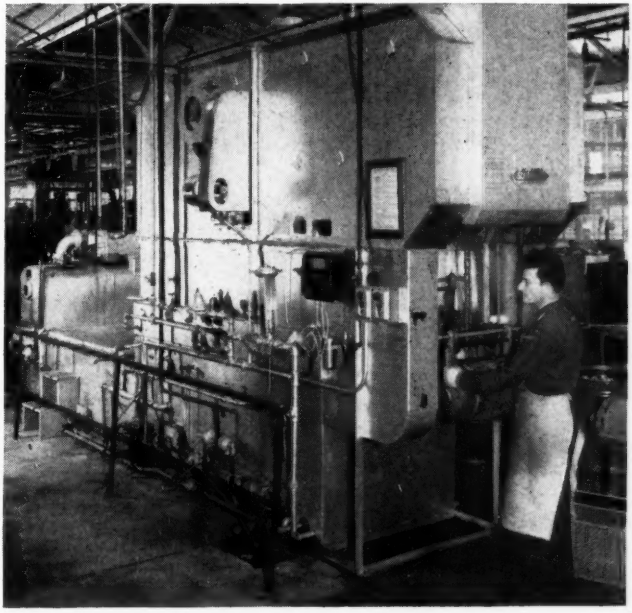

Fig. 1 — A view of crossrod conveyorized dip and vapor degreaser, equipped with ratchet type racks to cause rotation of cylindrical baskets in their passage through immersion degreasing cycles and thus effecting complete drainage of cup-shaped parts (*Photo courtesy Detrex Corp., Detroit, Mich.*)

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are a few quoted excerpts that offer convincing proof.

Says one observer:[6] "The success of any finish coating on metal depends almost entirely on adequate surface preparation of the metal before it is painted. The best finish will often show poor performance characteristics if the metal over which it is applied is not properly treated or cleaned."

Declares another:[7] "Use of quality paints is one-half of the story in satisfactorily finishing metal articles; use of effective surface-preparation techniques is the other half. Together, these two factors form the right combination for an enduring finish."

States a third:[8] "The success of all plating operations is dependent on the cleanliness of the work before entering the plating solution."

In plating, as in no other finishing operation, explains another observer, the importance of cleaning must be heavily stressed, "for in this operation it is absolutely necessary that the surface be as clean as it is humanly possible to make it. Surface deposits of soil and contamination on the articles prevent an even plate, or may go so far as to prevent plating at all. Other deposits may alter the color of the plated coating."[9]

Similarly, plated coatings applied to uncleaned or poorly cleaned zinc surfaces are very poorly adherent, cautions a fifth authority, adding this explanatory note: "The surface must be free from grease, dirt and reaction products from the cleaner if satisfactory adhesion is to be attained. Reaction with the cleaner must be avoided particularly when the work is to be plated with copper."[2]

Speaking of processing magnesium surfaces, another authority points out:[10] "The effectiveness of subsequent coating processes depends to a marked extent upon the removal of surface contamination by proper cleaning methods."

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Yes, the part that proper cleaning plays in the flawless finishing of die castings is all-important. It is best expressed, perhaps, in the words of one nationally prominent supplier of cleaning compositions:[1] "Before any electroplated, chemical, organic or other coating or final finish is applied to die castings, a preliminary **cleaning** or related **surface preparation** operation is highly essential and a factor of extreme importance because of its

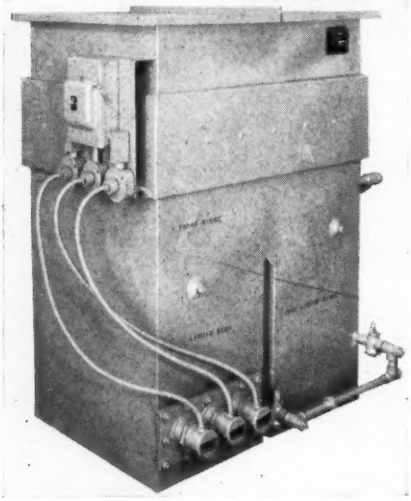

Fig. 2.—This illustration shows a standard 3-stage degreaser which has a boiling solvent wash, cool solvent rinse, and final vapor rinse. (*Photo courtesy G. S. Blakeslee & Co., Chicago 50, Ill.*)

marked influence on the finishing results obtained. Incomplete cleaning or incorrect materials used for surface preparation invite failure of plated, chemical, or organic finishes or coatings. And because good adhesion is not obtained, rejects inevitably result. Rejects cost money, delay production, and curtail output."

To sum up these and similar observations based on long-accumulated plant experience and shop practice: "The foundation on which the successful and durable finish is built is a properly prepared surface. It is impossible to over-emphasize the importance of proper basis metal preparation."[5]

The selection of a cleaning cycle represents no cut-and-dried matter as it generally depends to a considerable extent upon a number of operational variables. Among these factors are, principally, these five: (1) the kind of metal and its surface condition; (2) the nature of the contaminants to be removed; (3) degree of surface cleanliness required; (4) type of equipment available; and (5) character of final finish applied.

Fabricators and finishers of die castings often are inclined to lump together all such articles for cleaning by a single standard procedure. This is a big mistake as the diversity of alloys used in the die casting process invariably makes individual and specialized treatment a necessity. For example, general degreasing or cleaning routines, especially those utilizing alkaline-type materials, applied to brass or bronze are not usually applicable to aluminum or magnesium. Again, a composition used for cleaning magnesium may prove entirely unsatisfactory for cleaning aluminum. The same may be said regarding lead, tin or zinc-base metals.[9] Since soft metals are more or less susceptible to attack by the alkaline constituents of the usual cleaner formulation of this type, a condition that often is not permissable or desirable,[11] they require different, less alkaline cleaning compounds than other metals if surfaces are not to be attacked.

The kind of soil and the extent of its deposition or severity of contamination require careful thought as this dual consideration is one important determinant of the ultimate choice of any particular cleaning material or method. Different types of accumulation often require different cleansing agents to effect complete soil removal.

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Then, too, if deposits normally caused by or created during fabrication, particularly those following the original casting, are not removed before any further working is undertaken, they fill up the microscopic pores found on the surfaces of die cast parts. Subsequently hardened by polishing, buffing or any of the many other processes usually employed, these impurities have become increasingly difficult to remove due to the heat, abrasive action and impact of surface finishing.[9] All these accumulations should be removed before they subsequently cause serious finishing trouble with its attendant waste of materials, excessive use of manpower, processing time delays, and other costly production interruptions.

As previously indicated, a very large percentage of die cast parts is further finished by chemical and mechanical surfacing treatments. Thus, the operation of cleaning after machining, cutting or shaping is decidedly important. Generally speaking, machining lubricants and cutting oils are easily removed, but frequently, however, because of the carbonizing effect of such compounds under heat or pressure, they leave small insoluble deposits on the surface. Congealed oil caused by the same factors further complicates cleaning. Moreover, as a result of shaping operations with their many handling steps, metal chips from the cutting or machining process are mixed in with the gummy oils. Work is then contaminated still further with shop dirt.[9]

Burnishing, polishing and buffing compounds which are not alkaline reactive require separate handling in many instances. Sulphonated oils and other residual deposits left by buffing compositions demand consideration.[9] Moreover, the heat generated during buffing—and this proves particularly true in the case of automatic setups—

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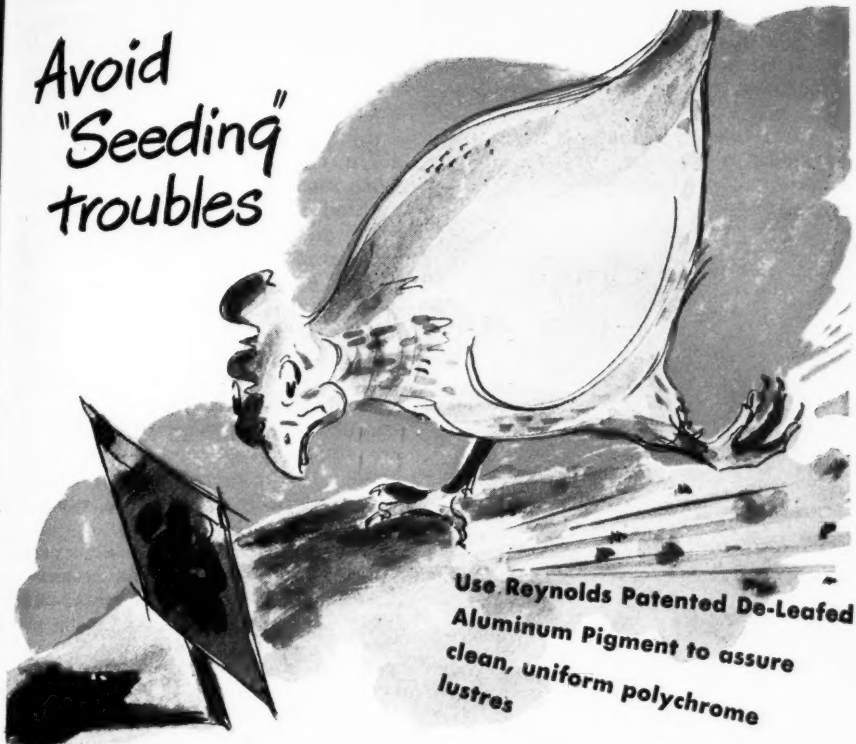

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tends to "cake" the compound trapped in recesses into a hard mass which must be softened through preliminary treatment in order to make final cleaning fully effective.[2]

In cases such as these, cleaning then becomes a two-step procedure: (1) thorough preliminary soaking (or "precleaning" as it is often termed) to soften and loosen deposits so that (2) final cleaning can remove these accumulations completely. Thus, when a dual-dip degreasing cycle is employed, plant experience indicates that the operation is accomplished faster, easier, and at lower cost, and also provides more satisfactory results than a one-step cleaning procedure.[1]

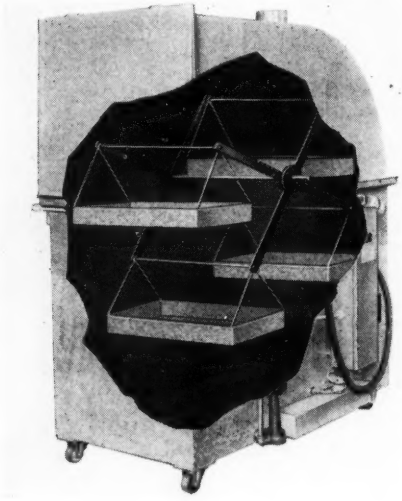


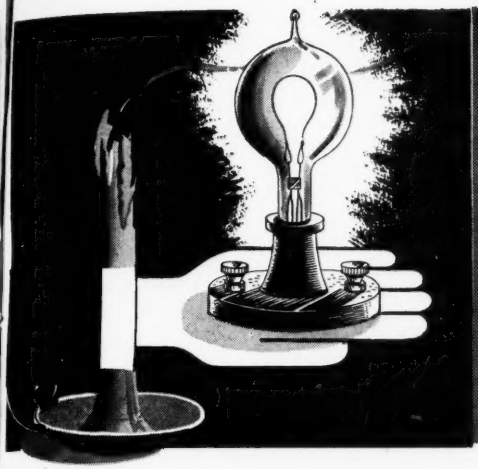
Fig. 3—Rotomatic vapor degreaser used to clean die castings, stampings, and assemblies. The parts to be cleaned are placed in baskets which are then suspended on the reel structure within the machine. Suspension of the baskets in the vapor for cleaning, removal from the vapor, and draining can be governed by an adjustable automatic timer.

(Photo courtesy Phillips Manufacturing Co., Chicago, Ill.)

The cleaning of parts following casting and before mechanical finishing is an intermediate link in the production chain that is generally advisable; however, operators often fail to carry it out, figuring that they will have to clean castings in the end anyway. Such reasoning leads to false or short-sighted economy in the long run from the standpoints of time, cost and results simply because the polishing or buffing of dirty surfaces makes an already difficult job more difficult than ever and thus multiplies the chance for finishing troubles to develop. Not only are unnecessary scratching or surface abrasions produced that inevitably show up later, but the original accumulation of soil becomes embedded in the metal pores, increasing the complexity of the final, complete cleaning operation.[9]

During World War II performance and speed were the prime criteria of adequacy applied to most metal-working processes and are becoming even more important requirements now.[12] The war taught us, among other things, more efficient and economical ways of cleaning metals, with the efficiencies gained primarily through both improved design and better utilization of equipment and secondarily through changes in cleaner formulation.[13]

Manufacturers of cleaning compounds have developed a wide variety of scientifically blended and balanced compounds and solutions which are designed specifically for metal cleaning prior to finishing.[6] That new machines and detergents are being continually developed is a healthy, encouraging sign. It means that still further improvement of today's uniformly high standards, with its ensuing increase in more efficient and economical production-line performance, is anticipated by manufacturers of both machines and materials. The trend in the manufacture of these products and processes is toward items which will solve



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specific problems. The reason for this is the multiplicity of metals and alloys requiring specific treatment to effect removal of their contaminants—some of which have been examined here.[12]

Further indicative of the active, vital interest in cleaning problems on the part of producers of cleaning compounds is the fact that they have provided much of the valuable data already published.[12] Since they have acquired a wealth of specific data from which to draw, they should be consulted for recommendations and suggestions.[6] In those cases where detailed information has not been published, proprietory or patented compositions have been specially designed for specific operations. A qualified staff of application specialists is often maintained to assist in solving cleaning problems—a matter of great value and importance to the user of the process in question.[12]

Proper, effective cleaning means the thorough removal of the dirt, oil and grease acquired in fabrication and handling and, in addition, the complete removal of oxide or other films developed during storage or in the cleaning operation itself. For this purpose there are now in use generally throughout the finishing industry a number of methods[2] which, used either alone or in various combinations, prove suitable for effectively handling almost any cleaning job.[1,13]

These cleaning processes, briefly described below, may be divided into the following four general groups: (1) solvent cleaning; (2) alkaline cleaning; (3) acid dipping, pickling, or other acid-detergent treatment; and (4) mechanical cleaning. The choice of a particular routine or a combination cycle depends mostly on the individual job to be done and the available processing equipment.

Organic Solvent Washing

Where production requirements for lacquering, enameling or painting are small or where conditions do not economically warrant any equipment investment, washing with organic solvents is the most commonly employed practice.[6] Effective cleaning is accomplished by means of such materials as trichlorethylene, xylene, ethyl acetate and carbon tetrachloride;[2] however, others are also employed.[6]

In using the organic solvent washing method, workmen simply wipe the surface with solvent-saturated cloths and then wipe the work dry with clean dry cloths. Before becoming too contaminated, both the solvent and cloths must be discarded or cleaned.[6] In average production practice, however, solvent wiping is seldom satisfactory in that not only is it laborious and costly but also because both the solvent and the rags soon become contaminated to a point where it is questionable whether or not the object was cleaner before or after wiping.[14]

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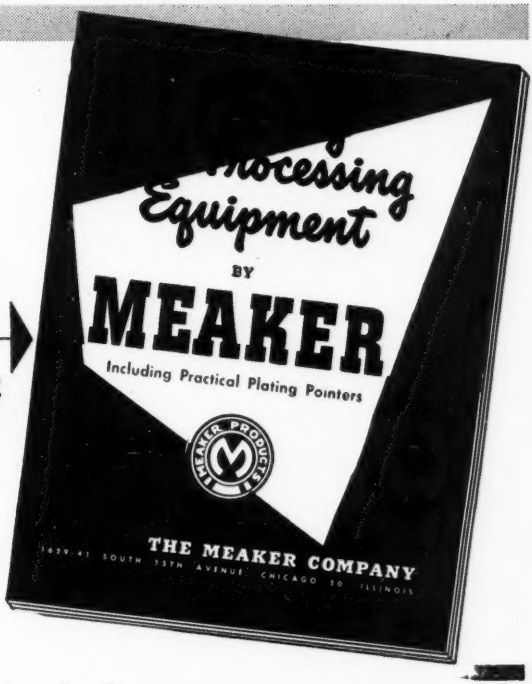

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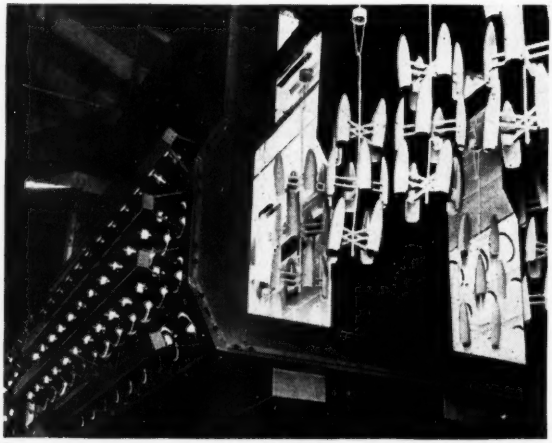
A measure of success of any cleaning operation is to determine whether or not a film of water will adhere to the surface without a break. Only a surface completely free from oil and grease passes this test.[14] Since most solvent cleaning methods depend upon solution of the grease by simple washing with or immersion in the solvent, the last trace of solvent to evaporate from the surface leaves the metal coated with a thin grease film. A vastly improved, far more effective form of solvent cleaning—vapor degreasing or vapor rinsing in the commercial systems using trichlorethylene—overcomes this undesirable occurrence.[2]

Vapor Degreasing

It is for these reasons chiefly that where solvent cleaning is used as a surface-preparation procedure, the processes of vapor degreasing and spray cleaning with organic solvents have gained extensive use. They have, in fact, contributed immensely to more streamlined production procedures, having proved particularly effective for removing light oils and greases. A readily available vapor degreaser or a solvent cleaning spray booth can be employed to great advantage in cleaning these light deposits from parts during manufacture. As a production expedient, they have made possible better quality by providing sufficiently clean parts, easier to work on, from one handling operation to another.[9]

The use of chlorinated hydrocarbons of the non-inflammable type (such as trichlorethylene and perchlorethylene) in closed cycle degreasing systems has found widespread application in industry for preliminary cleaning before plating and before painting where phosphatizing processes are not required. These degreasers may employ vapor or liquid phase cleaning, with or without spray, scrubbing action or combinations of some or all of these



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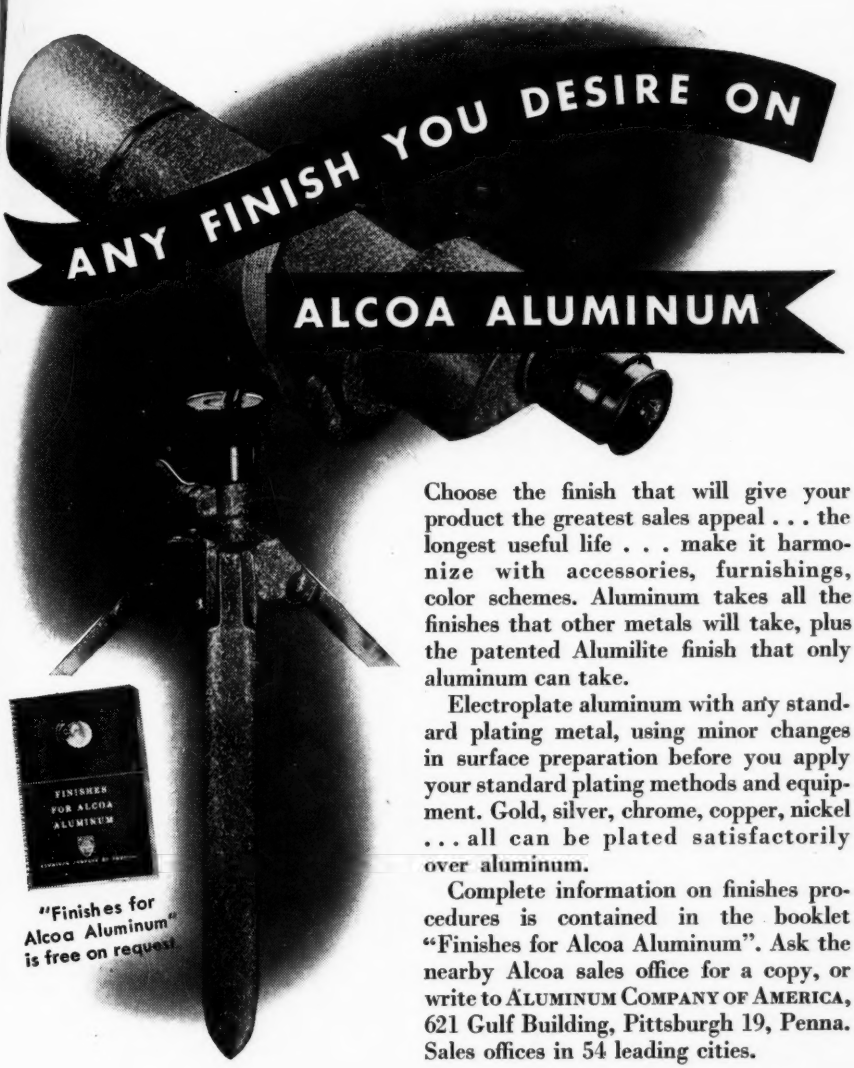

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methods. It can be easily understood that a system not properly safeguarded against vapor loss will cause excessive cleaning costs.[11]

Equipment ranges from simple tanks to automatic outfits, divided into three different types: (1) vapor degreasing units; (2) vapor spray degreasers; and (3) immersion-vapor degreasing machines. With the simple vapor degreasing method, hot solvent vapors condense on the cold metal moved into the vapor. After dissolving any surface oil and grease, this condensate drips back to the bottom of the tank where the heat causes the solvent vapor to rise, leaving the deposits to accumulate in the heating sump. When the metal reaches a temperature of 190 deg. F., condensation on the metal surface stops. Any loose dirt remaining on the surface of the degreased article is removed with a dry chamois or tack rag.

In the second process, vapor degreasing is supplemented by a pressure spray application of a liquid solvent which assists in removing dirt and any insoluble material which otherwise would have to be rubbed off. In the third modification, the work to be cleaned is dipped in hot solvent and cold solvent rinses. Vapor cleaning is the final step in each type of cycle.[6]

When using vapor degreasing equipment, certain essential precautions should be followed for reasons of operating safety as well as for maximum efficiency and economy. Adequate ventilation should be provided to remove excess solvent vapors. Also, where it is not possible to avoid skin contact with solvents, workers should be provided with protective clothing or creams and good washing facilities.[15] New solvent additions should be made periodically to compensate for carry-out; the solvent should be renewed frequently as conditions may require. Dirty solvent should be reclaimed by distillation. Although not recommend-

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Fig. 4 — Illustration shows one type of cleaning machine designed for use with emulsifiable solvent cleaners. (*Photo courtesy Magnus Chemical Co., Garwood, N. J.*)

ed for removing buffing compositions or water-soluble material,[5] vapor degreasing has been found particularly effective in removing oils and greases from all work and is employed where aqueous solutions would be objectionable. For objects to be finished with organic coatings, no further cleaning is generally required; but with items scheduled for electroplating or chemical treatment, it is necessary to follow a vapor-degreasing operation with an alkaline cleaning to ensure the chemically clean surface on which good adhesion is based.[13] Even when vapor rinsing is used, the use of an alkaline cleaner and an acid dip following the solvent treatment is recommended in many cases, particularly with zinc die castings. Properly carried out, this procedure ensures removal of remaining dirt and grease films and any oxides, and so on, which may be present.[2]

At the same time, however, the production man should realize that modern vapor degreasing methods offer many advantages when used in present-day finishing operations. These include: maximum production in minimum space and complete penetration of close-fitting parts without disassembly, thus resulting in reduced handling; substantial reduction in some cases in the quantity of chemicals required for such subsequent processes as acid-pickling.[17]

Suppliers of chlorinated solvents and equipment for solvent vapor and spray degreasing should be consulted for detailed instructions covering the care of the solvents, operation of machine, and maintenance of equipment. Where this process is in use, the instructions should be made available to personnel responsible for the operation of the equipment and should be carefully followed to avoid solvent breakdown and excessive solvent usage.[5] Serious plating troubles due to faulty degreaser operation have been observed on more than one occasion in plant practice.[2]

Emulsion Cleaning

An alternative pre-cleaning method employs an emulsion or emulsifiable solvent cleaner such as those based on the use of a low-cost mineral distillate like kerosene and an emulsifier or oil soluble soap,[18] applied by tank immersion. The addition of the emulsifying agent to the kerosene improves its penetrating power and solvent action, making it immediately emulsifiable upon contact with water. The time of work immersal in cleaning solutions of this category depends upon the degree of contamination present and on the temperature of the operation.

The dip ordinarily is employed at room temperature or slightly above. Penetration is increased if the bath is heated to 140-160 deg. F. Three to five minutes is usually sufficient to allow for penetration of the solvent, after which the work is rinsed in water by

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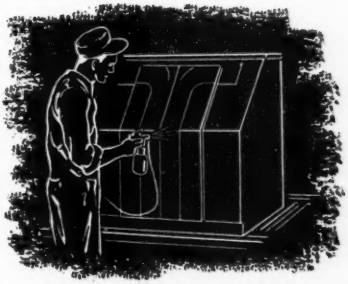

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dipping or spraying.[10] Used safely on all metals and alloys, emulsifiable solvents remove solid particles of dirt and water-soluble materials, such as soap and soluble oils. This type cleaner is most effective when used with good agitation, either mechanical or spray, and followed with a warm or hot water rinse. Where requirements call for a chemically clean surface, however, it is necessary to supplement emulsion degreasing with alkaline cleaning, preferably electrocleaning.[12]

Since the end of the war, great strides have been made in cold tank cleaning with water-rinse solvents, making possible greater efficiencies and economies in two-step degreasing than generally possible heretofore. Most metal-working compounds (grease, buffing compound, cutting oils and machining coolants[11]) as well as sludge and loose carbon deposits are removed quickly and simply.[9]

A relatively short immersion and a thorough agitated rinse or pressure rinse complete the cleaning cycle, providing parts that are thoroughly clean both on the surface and in the pores of the metal. In those cases where these solvents form soap, parts can be subsequently pressure-sprayed with water, immersed in an agitated tank, or treated with an organic solvent. For rinsing, however, the first application suggested is preferable. Upon contact with water, the cleansing agent emulsifies, washing away all the softened and loosened soil. Metallic chips and particles, which might have been clinging to the gummy accumulation on the work, are also freed and readily washed away.

Although made up of volatile constituents, these compositions present no obnoxious or hazardous odors, loss through evaporation, or fire hazard due to the seal incorporated in the original formulation. The seal also effects an economy by cutting down on the drag-out of the cleaning material, and, moreover, has been found on several occasions to make possible a better cleaning job.[9] An odorless, nontoxic material of this type provides still other advantages through the elimination of the possibilities of etching, pitting or discoloring the work.[11]

Alkaline cleaning techniques will be discussed in next month's issue of PRODUCTS FINISHING.

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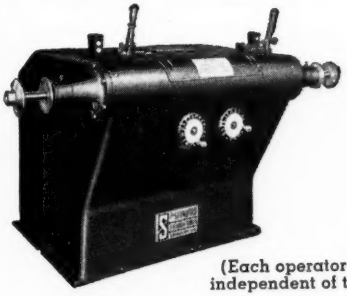

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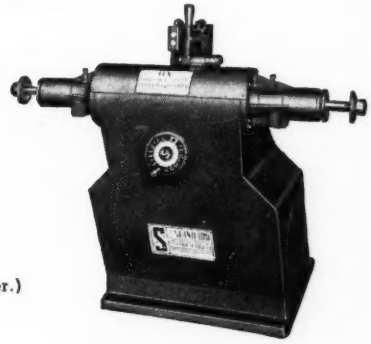

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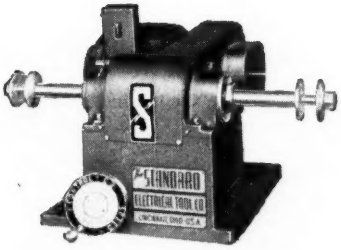

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[14] Paul O. Blackmore, "Finish-O-Phobia," Reprint from *Die Castings*, Ault & Wiborg Division, Interchemical Corporation, Cincinnati, Ohio.
[15] Arthur P. Schulze, "Preparing Aluminum for Finishing," *Light Metal Age*, March, 1946, pp. 14-17.
[16] George Black, "Vapor Degreasing," *Materials and Methods*, July, 1946, pp. 95-97.
[17] Allen G. Gray, "Finishing Clinic: Vapor Degreasing Offers Efficiency and Economy in Finishing Operations," *Products Finishing*, September, 1946, pp. 68; 70.
[18] L. M. Oldt, "Protective and Decorative Treatments of Magnesium," *Light Metal Age*, March, 1946, pp. 10-13.

Columbia Generator Bulletin. A four-page illustrated bulletin describing Columbia a.c. generators has been issued by the Columbia Electric Manufacturing Co., 4519 Hamilton Ave. N. E., Cleveland 14, Ohio. Construction features of the various parts of the generators are illustrated and described. Operating characteristics are outlined and the sizes available in the various models are listed. Copy free upon request.

Mico Bulletin. A four-page folder describing Mico Silicone-Base Heat-Resistant Aluminum has been issued by the Midland Industrial Finishes Co., Waukegan, Ill. Properties and characteristics of the modified silicone aluminum finish are described in detail. A list of materials and tests which Mico Aluminum finish has withstood successfully is furnished. Suggested applications of the material are included. Copy free upon request.

Vertical Abrasive Belt Polishing Machine Bulletin. A bulletin announcing the Hill Two-Roll Vertical Abrasive Belt Grinding and Polishing Machines for flat polishing has been issued by The Hill Acme Co., 6400 Breakwater Ave., Cleveland 2, Ohio. Designated as Bulletin No. GP-1, the announcement contains illustrations showing applications of the machines for polishing sheets, bars, or strip in coil form. Descriptive information accompanies the illustrations. Copy free upon request.

Metal Treatment Bulletin. A four-page bulletin describing Ferox, Texstl, Feroxolene, and Acidulum has been issued by Service Industries, 2103 E. Somerset St., Philadelphia 34, Pa. Ferox is described as being a rust-removing chemical which also possesses rust inhibiting characteristics. Texstl is a product used to form a protective film on metal from which the rust has been removed.

Feroxolene is described as being a heavy duty rust preventive for outside use. Acidulum is an acidproof plastic coating which is said to conform to U. S. Army Specification 3-106E for metal protection. Properties of these materials are outlined and instructions for their use are furnished. Copy free upon request.

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Finishing Small Parts on a Production Basis

By ROLLIN H. WAMPLER

IN many instances, the finishing of small parts on a production basis presents certain difficulties. Individual handling must be reduced to a minimum and in most cases the coating applied to the object must be flawless and uniform in appearance. Some different methods and types of equipment that have been evolved for finishing small parts are described in this article.

Spraying. One of the simplest ways of spraying small objects economically is to arrange a considerable number of them on large wire mesh screens, as illustrated in Fig. 1. The parts can then be quickly sprayed and air dried or baked as required without removing them from the screens. Where a particular part is to be finished on a large volume basis, it is often economical to design and install completely automatic spraying equipment wherein the spraying operation is synchronized with that of a conveyor which requires only loading and unloading as shown in Fig. 2. In some cases, it is desirable to include a drying oven in the system so that the articles can be loaded onto the conveyor and removed completely dry. With this type of equipment, one or, at most,

Fig. 1—A simple method for spraying small metal objects on a production basis is to spread the objects out on large wire mesh screens, as shown in this illustration.
(Photo courtesy The DeVilbiss Co., Toledo, Ohio)

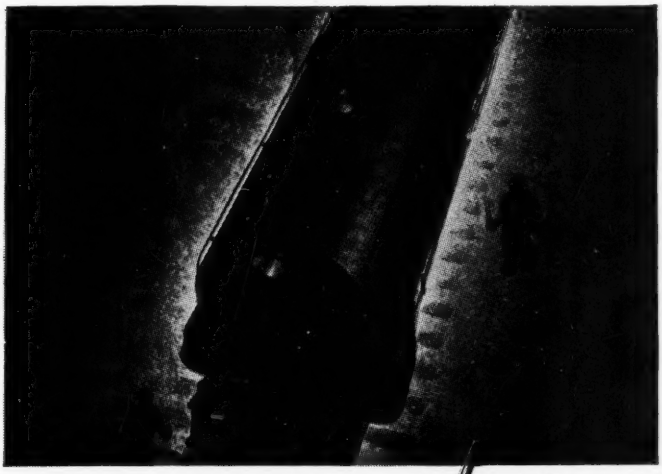

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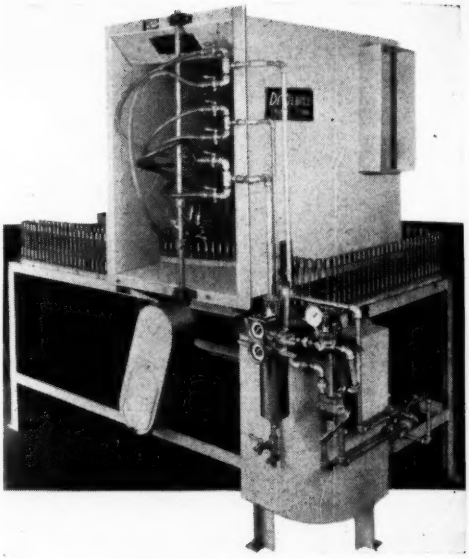
Fig. 2—This illustration shows a completely automatic spraying system engineered for finishing small metal parts on a large volume basis.
(Photo courtesy The DeVilbiss Co., Toledo, Ohio)

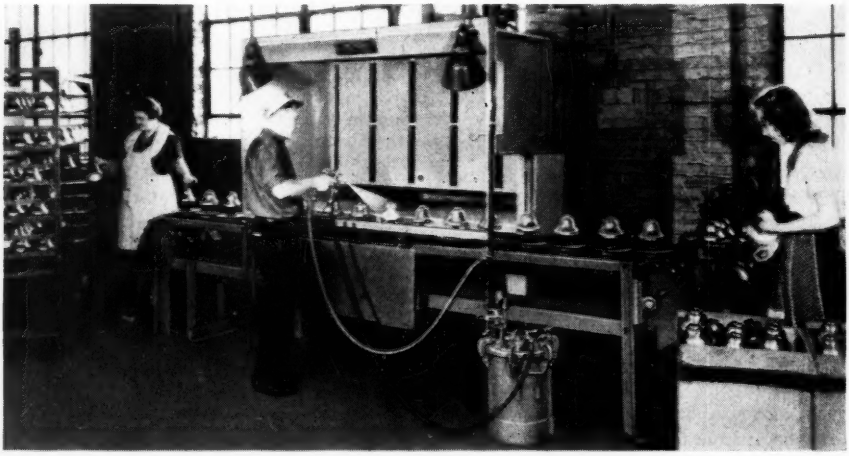


two operators are all that are required in order to finish the parts. Several manufacturers of special equipment are in a position to build automatic equipment engineered to the product.

Sometimes, the job of finishing small parts quickly and easily on a production basis can be handled by constructing a small conveyor to transport the objects continuously past an operator in a spray booth, as shown in Fig. 3. This type of installation requires three operators, two for loading and unloading the parts and one for spraying the parts.

Dipping. The manual dipping of small metal parts for the purpose of applying an organic coating is usually a time-consuming and costly method. For this reason, automatic multiple dipping machines have been devised

Fig. 3—The semi-automatic finishing installation shown herein comprises a small conveyor for continuously transporting small metal parts past a spray gun operator positioned in front of a spray booth.
(Photo courtesy Binks Manufacturing Co., Chicago, Ill.)



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which are designed to reduce handling and production time to a minimum. Where small objects are adaptable for handling on an overhead monorail conveyor, they can be dipped economically by simply arranging a loop in the conveyor with a dip tank under it. The movement of the conveyor provides for the automatic dipping and withdrawal of the articles, with the result that very little operator attention is required.

Figure 4 shows a machine which is designed for automatically dipping small parts, utilizing a wire basket, with the excess coating material whirled off the parts by centrifugal force. A machine of this type is especially suitable for use in finishing such small metal objects as nails, screws, and products having sharp corners.

Fig. 4—The enameler shown in this illustration is loading a basket of small metal parts into a machine which is designed to automatically dip the parts in enamel and then whirl off the excess coating material by centrifugal force. *(Photo courtesy Ronci Machine Co., Providence, R. I.)*

Fig. 5—This tilted open-top type tumbling barrel is intended for use in enameling, as well as cleaning, polishing, and burnishing, small metal parts. *(Photo courtesy Lupomatic Industries, Inc., New York, N. Y.)*

Tumbling. This method is well adapted to the production finishing of large batches of small metal objects. Machines for use in tumbling parts are produced in two general types. These include a tilted open-top type, as shown in Fig. 5, and a hexagonal barrel with removable door and mounted so as to revolve on its axis. The tilted open-top type is convenient for charging and discharging, is easy to clean, and permits the work to be inspected while the barrel is in operation. The horizontal type can be made in larger sizes than are practical for the tilted type.

The open-top tumbling barrel can be charged by simply pouring in the parts to be finished, following which the machine is started and the exact amount of enamel poured in gradual-

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ly. This amount is very critical and should be precisely measured each time enamel is poured into the barrel. The machine is designed to completely coat the objects within 2 to 5 minutes. The drying of the enamel may be hastened by directing a stream of compressed air into the batch while it is in motion, after which the charge is dumped into wire baskets or spread on mesh trays for drying or baking.

The open-top tumbling machine can also be used for cleaning small metal objects. In such cases, the barrel is charged and sufficient solvent added to thoroughly wet it. After a few minutes, the solvent is removed and a few rags are added. Following several minutes of tumbling with the rags, the charge will be clean and dry.

Sometimes during the process of tumbling with enamel, it is advisable to add a few ounces of toluol to the charge to provide for better distribution of the enamel. Also, a very small amount of pine oil or heavy petroleum solvent added to the charge may prevent sticking of the objects while the enamel is in the tacky stage.

Water-Wash Spray Booth Bulletin. Despatch Bulletin No. 66 describing the construction and operation of the Despatch Water-Wash Spray Booth is being distributed by the Despatch Oven Co., Minneapolis, Minn. Copy free upon request.

Air-Tumbler Catalog. A 10-page catalog describing types and models of Air-Tumbler dust collectors and suppressors has been issued by the Dust Suppression & Engineering Co., Lake Orion, Mich. The catalog illustrates and describes the action of the Air-Tumblers in collecting and disposing of dust in industry. Data sheets are included showing sizes, dimensions, and capacities of the dust collectors.

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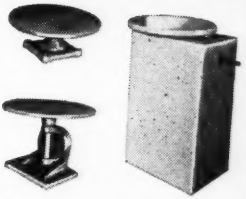

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Barrel Finishing of Metal Products

Part 23—The Progressive Development of Steel Burnishing Materials

By H. LEROY BEAVER
Barrel Finishing Consultant
Lansdale, Pennsylvania

WE have been asked so very many times to undertake to trace the development of the various steel forms of materials used in the barrel finishing process, and just as often we have in turn promised to undertake this, but for some reason or other the discussion has been pushed aside to make way for something else on which information seemed more urgent. This time we plan not only to start but as well to finish the job in hand irrespective of the number of discussions required.

At one time or another we have discussed round steel balls and their relative efficiency as compared to other forms of steel burnishing materials, but we have never undertaken to trace their history for you. Taken as a whole, all of the discussions that have appeared in print in the various trade papers, journals, publications of proceedings, and the like when traced back and reviewed constitute what would be termed the "bibliography" of barrel finishing. While we have diligently searched this record from many sources, all of the information we have been able to gather would hardly warrant its being termed a bibliography, for it would be found that for the most part the published articles have been what we would term "write-ups." Simply expressed, a write-up would be what an advertiser would expect some staff writer of a publication to provide for him to be published in the text of the publication as informative reading matter. The advertiser might use the most glowing description he could develop concerning his device and materials and what might be expected from their use in barrel finishing procedure. Thus, we have found that many of the claims made in this earlier material might quite easily be cast aside in the light of what we have learned in a continuance of the study of the present practice of the art.

For the purpose of tracing back these materials let us go back to the year 1901, which marks the first application so far as the record discloses of the use of steel balls in connection with the barrel finishing process (prior to that date, pebbles, crushed minerals, and forms of ground or pulverized earthen materials were the only mediums used in revolving barrels).

It is recorded that sometime in the period 1885-1901, Edmonds in England registered the very first use of steel balls in the barrel finishing process. The transition from plain cone bearings to ball bearings of the cup and cone variety was at that time just coming into being with the increasing popularity of the bicycle, and hence these balls were largely termed "cycle balls." These balls, definitely not the same as the balls currently used in barrel finishing, were formed by being turned from bars on a variety of automatic screw machines instead of being cold-headed. Upon referring to Fig. 1, you will note that for each ball so turned, there was lost sufficient material to produce another ball.

Many years ago we managed to accumulate a few of these earlier balls and, to be sure of their authenticity, we acid etched a number of them to disclose the amount of end grain that showed on the ball blank itself. The evidence was unmistakable that this was the accepted method of production of these earlier balls. Figure 2 presents an end view of the etched ball. Only a very thin band of the original surface skin of the rod from which the balls were formed was in evidence. The line of parting where the balls were snapped from the rod was also evident at each end of the ball or what we term the poles, for every round ball whether turned from the rod or headed from a cut slug, like the earth, has an equator and two poles.

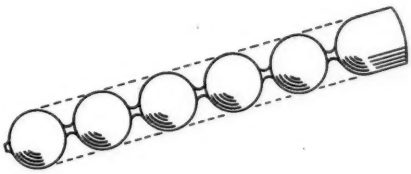
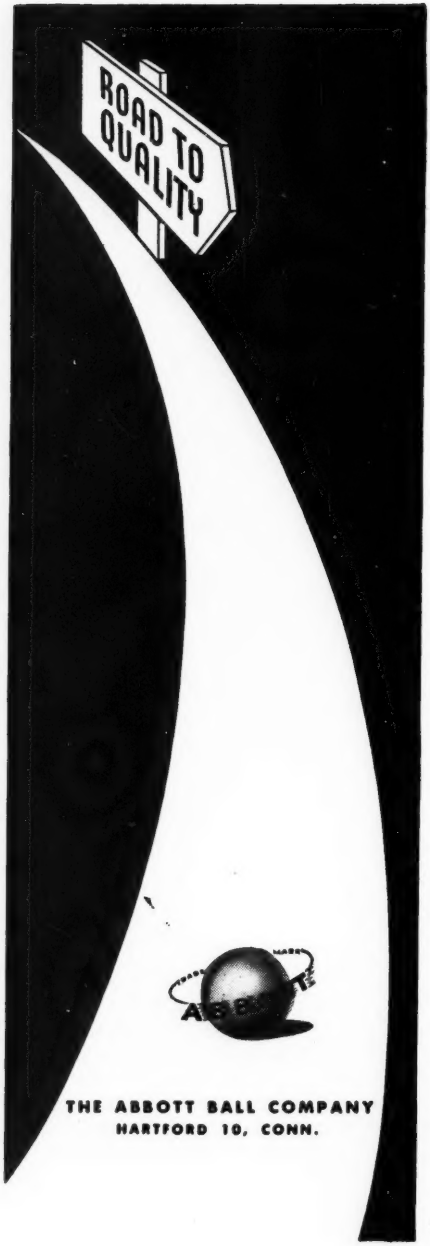


Fig. 1—Drawing illustrates method of manufacture of steel balls from rod stock.

We do not know and we have never been able to learn for what period of time we were dependent on England for our supplies of steel burnishing balls. Certainly it must have been right up to the time of the formation in Philadelphia of an organization known for many years as the Standard Steel & Bearings Company which, as we recall it, acquired the right for use in the United States of the same ball turning device used by the Hoffman Manufacturing Company of Chelmsford, England, the first source of supply used by Edmonds. The use of these ball turning machines was continued for many years right down to the time that balls were cold-headed by upsetting short slugs between dies on machines that had before been used only for the production of rivets and similar forms.

Fig. 2 — Drawing shows uniform end grain on etched steel ball turned from rod stock, and spot where ball was snapped from the rod.

As a matter of steel ball history it might be interesting to note here the formation of two other prominent steel ball manufacturers. In the early days of Standard Steel & Bearings Company, there were, among the operating personnel, two gentlemen who later occupied prominent places in the steel ball world; namely, Thomas J. Heller and Leander J. Hoover. Hoover first left the parent company and established at Merchantville, N. J., the first L. J. Hoover Steel Ball Company. In this venture he was joined by Mr. Otto W. Schaum, a prominent manufacturer of textile machinery in Philadelphia. Hoover finally determined that the Middle West was his best field and so he disposed of his interest in the Merchantville Company to Mr. Schaum, af-



ter which all of the production equipment was removed to Philadelphia and the name was changed to The Atlas Ball Company. At about this time Thomas J. Heller left the Standard Steel & Bearings Company to take over the active operation of the Atlas Ball Company as vice president and general manager, a post he held right down to the time that the Atlas Ball Company was absorbed by S.K.F. Industries of which it presently is a most important unit. Much of what we know of both bearing balls and burnishing balls was learned from this same Thomas J. Heller, an able, affable and courteous gentleman, for it was our honor to be his assistant for a period of something over seven years or until the time of his retirement from active business. He sensed the coming importance of barrel finishing procedure in the mass production of metal products and it was largely due to his constant encouragement and aid that we kept at our research activities all down through the years.

Leander J. Hoover located in Chelsea, Michigan, after leaving Merchantville, N. J., and there he organized the Chelsea Steel Ball Company. After a few years he disposed of his interest in this company, removed to Ann Arbor, Michigan, and organized the Hoover Steel Ball Company.

It is interesting as a matter of history to note that the three companies, Standard Steel & Bearings, Atlas Ball Company, and Hoover Steel Ball Company, all aware of the possibilities of the use of steel barrel finishing materials, did not seriously undertake to produce any materials specifically for that purpose. "Rejects," or balls not suited to any industrial application, were sold for barrel finishing purposes, but so far as we know, none of the companies mentioned ever made even a casual study of the importance of the subject nor issued any data regarding the use of balls in the process.

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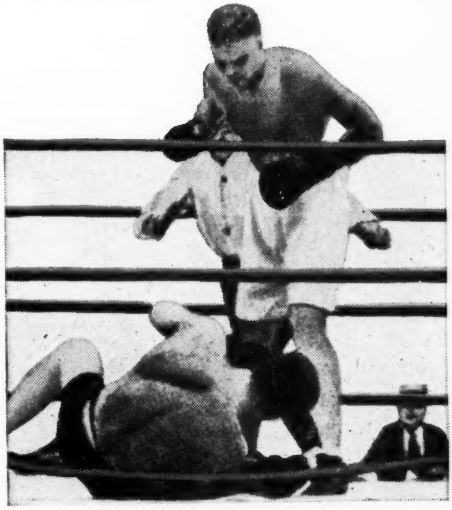

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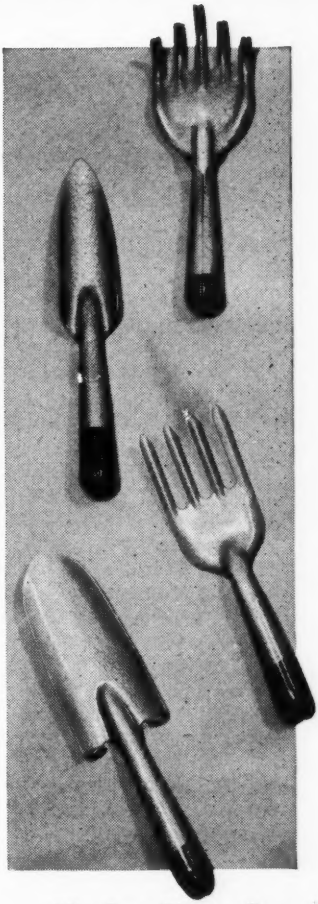


*By Gary-Pioneer Corp.

ZAPON

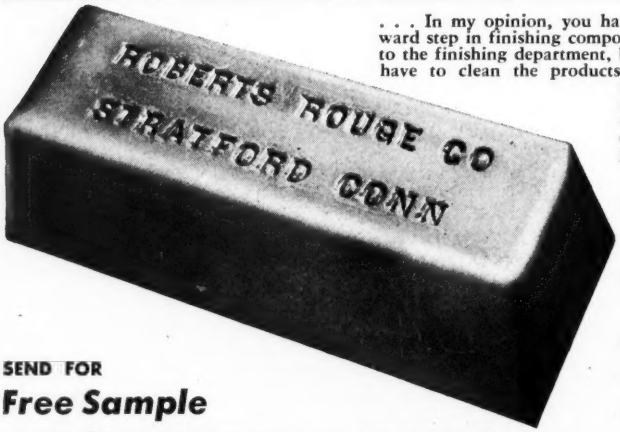
We shall now trace our steps backward just forty years. At that time George E. Abbott was head of the toolroom at New Departure Manufacturing Co., Bristol, Conn. This company was then, as it is now, in the very forefront in the production of bicycle hubs and coaster brakes, both of which of course used steel balls. It was doubtless the knowledge that George E. Abbott gained concerning steel balls and their application that prompted him to leave New Departure Manufacturing Company and establish his own business in the city of Hartford, Conn. It was here that he developed the beginnings of what is The Abbott Ball Company, and where he conceived the principles of what we have always termed the "high and narrow" type of burnishing barrel, the first of its kind in American industry.

It was at just about this time that George E. Abbott produced the first steel balls specifically for use in barrels as distinguished from balls to be used in bearings. The Abbott Ball Company then became the largest single producer of steel burnishing materials for use in barrels in this country.

Steel balls do not by any means approach the designation as a panacea for every barrel finishing ailment. True, they serve well in many applications, but in many ways they have been supplanted by other specially formed pieces which will be discussed at another time.

In the early years of barrel finishing and indeed up to about fourteen years ago, it was thought that only hardened and polished balls were in any sense acceptable for barrel finishing procedure. More intensive research has since taught us that soft annealed steel balls also have their uses and that in at least 50 per cent of present barrel finishing applications, soft balls will do a more effective job than the hardened and polished variety. This is especially true

"Your Water Soluble Rouge and Tripoli are going great guns here . . .



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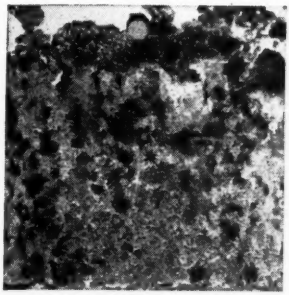

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Comparative salt spray test on 24St aluminum. Both panels were finished with one coat of baked refrigerator white enamel. Notice that after only 500 hours the paint system on the alkali-cleaned panel is almost entirely destroyed and the aluminum itself is badly corroded. In contrast, the paint finish is still intact on the Alodized panel after 2000 hours' exposure.

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in such cases as the removal of surface area of parts where some form of abrasive material is used in combination with the balls. When hardened and polished balls are used against hardened surfaces, there seems to be a tendency for the balls to simply "glance" off the surface of the abrasive and the action is much retarded. When soft annealed balls are used, the abrasive seems to "bite" into the surface of the soft balls, where in a sense it is held in suspension as the parts pass through the mass and in this way a far faster cutting action is obtained. This is also true of soft annealed balls when used as a medium for burr removal. The soft balls literally bite into the burr and wipe it from the edge of the parts, especially stampings. In this operation, no abrasive material is used, and the parts are operated in wood lined barrels with only the soft annealed balls and plain water.

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When we think of the processes required for the forming and finishing of the first steel balls used in the barrrel finishing process, the wastefulness of the method and the high production costs, we can perhaps better understand the following comment of a writer in "American Machinist" for April 1910:

> "Naturally when we consider using say a couple of pecks of balls for burnishing of thimbles or other small parts, a peck at a time, the question of expense will come to mind instantly and lead us to wonder how the process can be an economical one even though the balls are used over and over again."

That of course might well have been true of steel balls turned from the rod, but as time has gone by newer and better methods of production have been applied, and today, considering the many steps taken in their manufacture and the high quality of the product, the cost of steel balls is not now inconsistent with economical barrel operation.

This, and perhaps the next three or four discussions on barrel finishing are not intended to be useful in adding information covering the application of the materials or methods for their use, but are intended to set down the historical side of the development of barrel finishing materials. Nowhere in the entire record that we have been privileged to examine has any such information ever been published. For its historical value to those who will be interested in barrel finishing in the years to come, will we prepare this material so that in later years anyone feeling disposed to prepare a bibliography of barrel finishing will have all of the facts that it is possible for us to give both from our own experience and from our personal acquaintance with the originators of both barrels and materials, all of whom have passed away without leaving, to our

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knowledge, any written material covering their earlier efforts.

With the use of balls many things heretofore thought to be impossible of accomplishment have been achieved. If you will follow this series, you will find that as newer materials were developed, new avenues explored, the field of barrel finishing has been vastly extended and there is every reason to expect that this extension will continue as research develops newer methods and materials.

American Standards Association Price List. An up-to-date list of all national standards approved by the American Standards Association has been published by the American Standards Association, 70 E. 45th St., New York 17, N. Y. Included are lists of standards on ferrous materials and metallurgy, non-ferrous materials and metallurgy, chemical industry, automotive industry, and other industries and engineering groups. Copy available upon request.

Nuodex Bulletins. The following bulletins have been issued by Nuodex Products Co., Inc., Elizabeth, N. J.: "Drier Activity at Elevated Temperatures," "A Study of the Use of Driers in Soft Oil Varnishes," "The Quantitative and Qualitative Determination of Drying Metals in Driers and Surface Coating Materials," "Nuodex Technical Manual," "The Laboratory Determination of Drying," and "The Effect of Driers on the Chemical and Water Resistance of Aged Varnish Films." Copies available upon request.

Felt Polishing Wheel Brochure. The Bacon Felt Co., Winchester, Mass., has issued a 16-page two-color illustrated brochure listing the company's complete line of felt polishing wheels, bobs, sheets, hair felt, and marble buffers. The brochure describes the various felt polishing products manufactured by the company and provides data on sizes available in the various grades. Specific uses for the felt wheels as applied to the finishing of the various metals are outlined. A list of general industrial applications is included. Copy free upon request.

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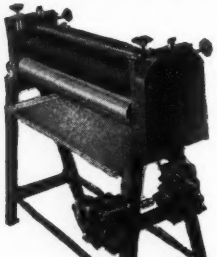

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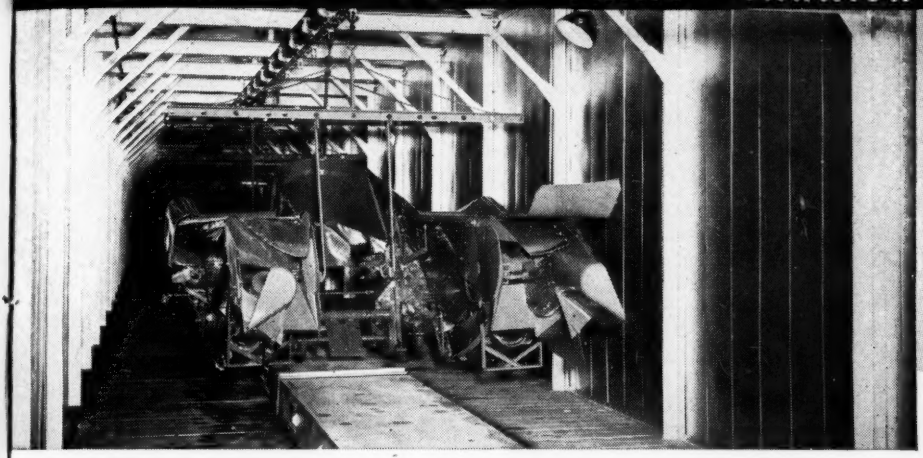

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Finishing Clinic

Accelerated Exposure Testing of Organic Coatings

By DR. ALLEN G. GRAY

•

A Monthly Digest of Current Technical Progress Indicating Significant Trends and Developments in the Finishing Industry

•

IN view of the many factors that influence the durability of organic coatings, and because of the fact that good organic coatings require a relatively long time to deteriorate, methods for evaluation of their durability have been active subjects among metal finishing technologists for a number of years. Consequently, irrespective of physical testing methods, two different schemes for evaluating the relative durability of different organic coatings have been developed. One consists, essentially, of exposure tests at carefully selected sites; the other involves accelerated test cycles conducted in appropriate test devices.

In either application of exposure testing procedures, the results obtained depend primarily on the careful recording of visual evidence of degradation. Another scheme, which is finding more and more favor in testing procedures, consists of evaluating the physical changes taking place in the course of exposure, and attempting to relate these changes to exposure life. Thus, in this method it is not necessary to await the visual appearance of decay of coatings, inasmuch as past experience and the symptoms leading to such evidences can be clearly recognized at an early date.

The chief limitations of normal outdoor exposure tests are the length of time required to obtain results and the variations between climatic conditions and the various exposure locations. Thus, it has been the aim of metal finishing engineers for some years to utilize

THIS MONTH... Accelerated Exposure Testing of Organic Coatings . . . Importance of Proper Control in Anodizing Aluminum Alloys . . . Preparation of Base Metal for Gold Plating. . . Non-Metallic Coatings for the Protection of Steel.

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accelerated exposure tests in which the various outdoor exposure factors could be simulated and intensified. Test devices have been developed in which a series of panels can be exposed to a number of different conditions, and a large number of different exposure cycles have been tried. Salt fog chambers, humidity rooms and cabinets, and the so-called "weathering machines" are well-known examples of equipment used for the accelebrated type of test. It should be recognized that in many cases these tests must be made on a comparative basis since the testing conditions may not be reproducible or the results may not lend themselves to numerical evaluation. Thus, corrosion tests of this type may consist in the exposure of suitable specimens to various environments and in determining the point at which attack upon the base metal begins or reaches an allowable level. Frequently the thickness and/or combination of coatings are varied as a means of determining rates of deterioration for different combinations.

Salt Spray Test. The salt spray test is commonly used for organic finish testing and consists of atomizing a 20 per cent salt solution, allowing the salt fog to pass over the test samples. The method described in A.S.T.M. Specification B-117-44T is widely used. Shown in Fig. 1 is a commercial apparatus for salt fog commercial testing. The salt spray test is also valuable for comparing the efficiency of phosphate and other coatings used under organic finishes.

In testing organic finishes to be used on appliances at the Bridgeport Works Laboratory of the General Electric Company, according to Pringle and Yako in describing the procedure used before the Spring 1947 technical session of the A.S.T.M. in Philadelphia, an "X" is scratched in the center of the finished panel, cutting through the coating and exposing the bare metal prior to the time the panel is hung in the salt spray cabinet. Panels are tested for 200 hours and examined daily for signs of deterioration. At the end of this 200-hour period the panels are removed, washed, dried, and rated. The rating is made on the basis of ten being perfect. Failure in salt spray usually shows up in the form of corrosion creepage back from the scratch in the panel and from the edges of the panel. Grading is done by subtracting one point from the ten for each one-sixteenth of an inch creepage. Usually not more than one-sixteeth of an inch creepage is allowed.

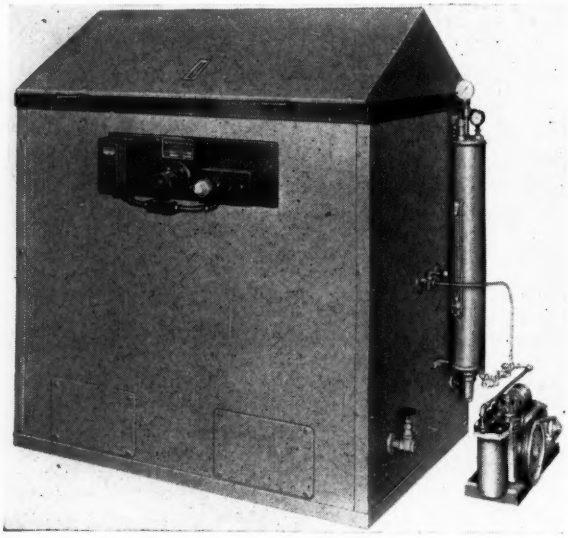
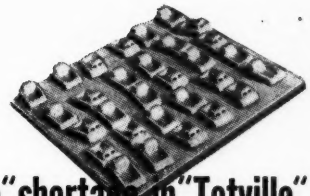


Fig. 1 — Commercial form of salt fog corrosion test equipment
(Photo courtesy Industrial Filter & Pump Mfg. Co.)



no "auto" shortage in "Totville"
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Production of the toddler's edition of the family car, "TOOTSIETOY," has been doubled by the manufacturer, DOWST MFG. COMPANY, since a G-W Infra-Red System replaced the gas-fired ovens.

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Designed, built and installed by G-W, this infra-red system at the Dowst plant typifies the completeness of G-W service. Results emphasize the advantages of working with an organization like G-W—a pioneer in infra-red who utilizes the experience of over 130 years in designing and building materials handling equipment.

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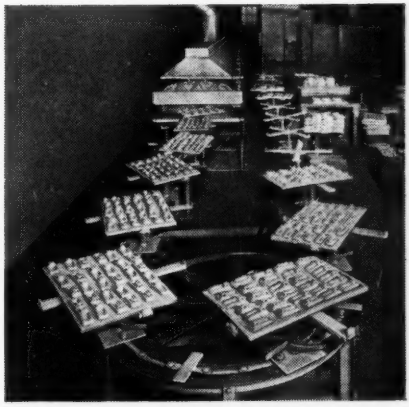
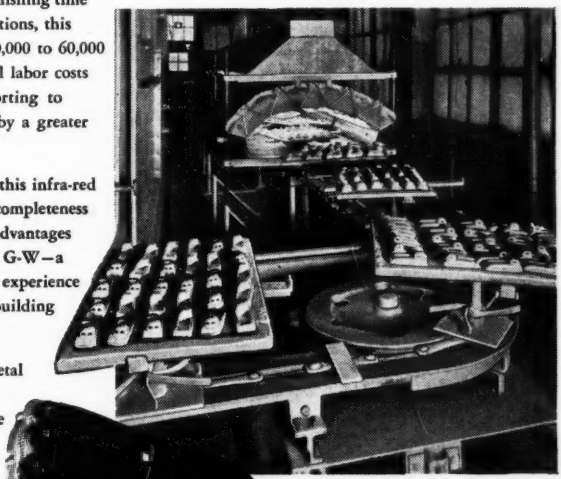


"Tootsietoy" Auto Bodies being Conveyed from Infra-Red Tunnel to Unloading Station.



G-W Turntable Loop Conveyor feeding "Tootsietoy" Cars from Spray Booth into 28 Ft. Baking Tunnel.

Close-up of "Tootsietoy" Kaiser Car finished by G-W Infra-Red System in plant of Dowst Mfg. Co., Chicago, Ill.

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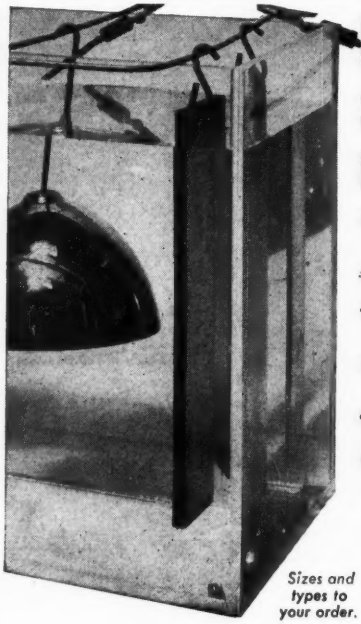
Moisture Resistance Tests. Exposure to 100 per cent relative humidity in the vicinity of 100 deg. F., or immersion in water at 100 deg. F., is used for determining the moisture resistance of organic finishes. The humidity test is conducted in a room or chamber in which the relative humidity is maintained at 100 per cent through the use of live steam or an immersion heater in a tank of water. The temperature should be maintained at 90 to 100 deg. F., and air circulation provided to maintain uniform conditions throughout the chamber. Some tests are so arranged that the test panels are mounted on platens or pipes through which water is flowed so that they are cooled just sufficiently that constant sweating occurs. The water immersion test is made by immersing the test panels in a water bath maintained at 90-105 deg. F. The water should be changed periodically. Generally, it is considered that the two tests provide comparable results for film blistering, but the humidity test provides better results for underfilm corrosion.

In carrying out the test, the panels should be examined at the end of 24, 48, 96, 500, and 1,000 hours for blister formation, underfilm corrosion, adherence, softening, and checking or cracking of the finish. It has been reported that a finish that stands up for 1,000 hours is satisfactory, from the standpoint of moisture resistance, for use on refrigerators. The moisture resistance requirements for finishes for other appliances are somewhat lower than for refrigerators. The humidity and water immersion tests are also very valuable for checking parts for surface contamination before finishing.

Color Retention Tests. Color retention tests should give an indication of the ability of an organic finish to retain its original color and gloss over a long period of time. The color reten-



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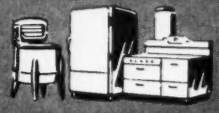
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tion of white finishes may be affected by many exposure conditions, and there is one test which reveals complete information. The initial color change in an organic finish, commonly called bleach after baking, can be

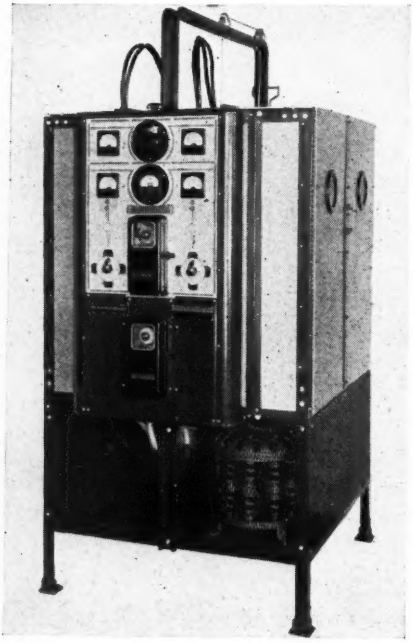

Fig. 2—Atlas Weather-Ometer used in the accelerated testing of coatings (*Photo courtesy Atlas Electric Devices Co.*)

checked by masking a portion of the panel and exposing for two points to bright sunlight. After exposure the finish should be placed in a dark room free to air circulation for 24 hours and examined for the degree it has returned to the original color. Definite bleaching affects the color matching of metal parts in assembly, and may show up adversely as a contrast between protected and unprotected areas in display cases. A comparison of the color retention under clean exposure conditions can be made by exposure under glass to sunlight for a period of two weeks, one month, and two months.

In carrying out the color retention tests in the Bridgeport General Electric appliance finish test laboratory, according to the description previously referred to, test panels after aging for 48 hours to allow for normal bleaching are exposed to the ultraviolet rays of an Atlas Weather-Ometer. An illustration of commercial equipment of this type is shown in Fig. 2. Half of the panel is shielded from the ultraviolet rays with aluminum foil so that the original and final colors may be compared at the end of the test on the same panel. The test is continued for 200 hours, at the end of which time it is required that the finish must not have dulled or noticeably discolored.

In any testing program to aid in the selection of a finish, it should be remembered that such selection is dependent on the use of the end product, but no matter what the product, it should be a balanced finish, in which one outstanding property is not gained at the sacrifice of other necessary properties.

* * *

Importance of Proper Control in Anodizing Aluminum Alloys

THE oxide coatings formed on aluminum by anodic treatment constitute one of the most important classes of finishes for aluminum alloys. By controlling the process the characteristics of the coating can be varied over a wide range. The coating is intrinsically hard and offers substantial resistance to wear and rubbing abrasion. The value of anodic coatings for specific applications is usually determined by measurement of one or more of the specific properties required. Properties such as hardness, abrasion

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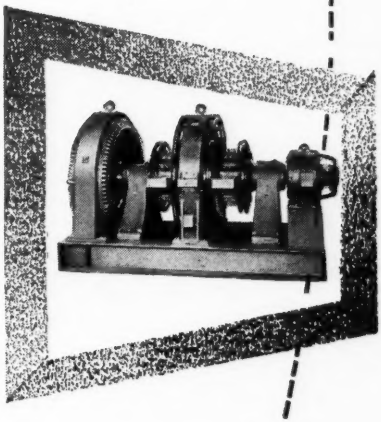

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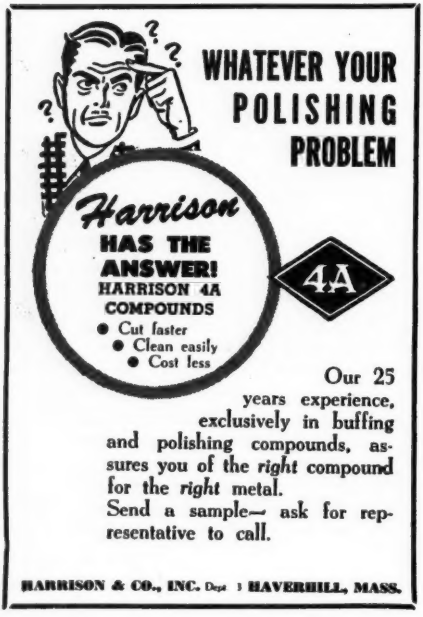
resistance, thickness, absorptive capacity, or resistance to corrosion may be varied widely by changing the coating characteristics.

Some of the factors which affect the formation of aluminum oxide coatings produced by the anodic treatment of aluminum in sulfuric acid and oxalic acid electrolytes were presented by Ralph B. Mason and Charles J. Slunder, in the December 1947 issue of "Industrial and Engineering Chemistry," based on work carried out at the Aluminum Research Laboratories, New Kensington, Pa. The development of suitable test methods and the determination of the effect of the operating variables on the properties of the anodic oxide coatings on aluminum alloys have been the subject of considerable research. One such test method, which involves a measurement of the anodic coating weight by dissolving it in a solution of phosphoric and chromic acids, has been found valuable for determining the efficiency of anodic oxidation and showing the effect of either minor or major changes in the coating procedure. Preliminary experiments indicated that even very small changes in the operating conditions of the anodic oxidation process were easily detected by changes in the weight of coating or in the weight of metal removed.

A convenient unit for expressing the results was obtained by dividing the weight of coating formed under the conditions of test by the weight of metal removed during formation of the coating. This "coating ratio" is a measure of the overall anode efficiency with respect to coating formation. Thus, a coating ratio lower than the theoretical ratio 1.889—the value reached if, in the case of pure aluminum, all the metal which reacts electrochemically is converted to the oxide—indicates that alumina has been dissolved by the electrolyte, either chemically or electrochemically. A satisfactory solution for stripping the anodic oxide coatings consists of 35 ml./l. of 85 per cent phosphoric acid and 20 g./l. of chromic acid, used at a temperature of about 200 deg. F. for 5 minutes or until all the oxide is dissolved. The specimen is carefully weighed before and after. By subtraction the weight of coating and weight of metal lost are obtained and from these values the "coating ratio" can be ascertained.

Alloy Composition. It was reported by Mason and Slunder that aluminum metal of a composition that approaches 100 per cent purity is consumed anodically at close to 100 per cent efficiency. Aluminum of commercial purity (2S) was checked and found to dissolve at an anode efficiency of about 97.5 per cent. One point was brought out strikingly, regarding the effect of metal composition, by the 17S-T and 24S-T samples. While, as brought out by Mason and Slunder, it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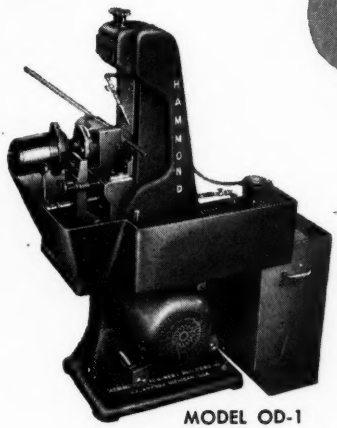

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was previously known that coatings on alloys of these types were not so thick or abrasion-resistant as those on pure metals, the experiments showed that

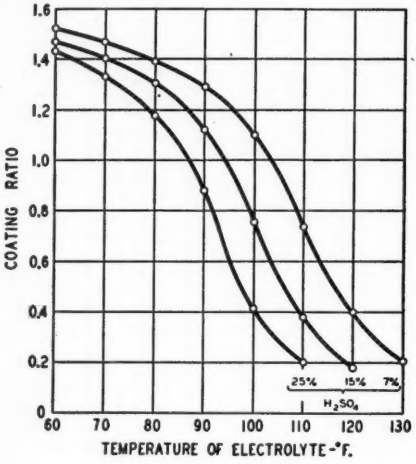

Fig. 3—Chart showing variations in coating ratio with temperature of electrolyte of high-purity aluminum
(Illustration courtesy "Industrial and Engineering Chemistry")

the coating ratio is markedly decreased and also that only about 80 per cent of the current is effective in reacting with the alumium. For these tests the specimens were anodized in 15 per cent sulfuric acid at 18 amp./sq. ft. and 70 deg. F. for a period of 30 minutes.

Concentration and Temperature of Electrolyte. Figure 3 presents curves of coating ratio against temperature of anodization for three sulfuric acid electrolytes. It was pointed out by Mason and Slunder that these curves have the expected form, since it is known that the hardest and most dense coating ratio obtained for all three concentrations of acid, as the temperature is raised above 90 deg. F., indicates that thinner, more porous coatings are formed because of the increased solvent action of the warmer acid.

Current Density. It was found that a heavier and denser coating was obtained at the higher current densities, which was explained by Mason and Slunder on the basis that the coating is formed at a faster rate, and, for the passage of the same quantity of electricity, the coating remains in contact with the solution for a shorter time and thus is subject to less chemical attack. Therefore, the slope of the curve representing the metal dissolved as a function of the "coating-ratio" should be steeper at the lower current densities, and Fig. 4 shows this to be the case.

The metal removed is a measure of the ampere-minutes used in the cell, and the curves show that for the same quantity of electricity the heavier and denser coatings are formed at the higher current densities. This would indicate that, from a practical standpoint, the highest current density consistent with satisfactory properties and economical operation should be chosen. However, the voltage required increases and the anodic coatings may

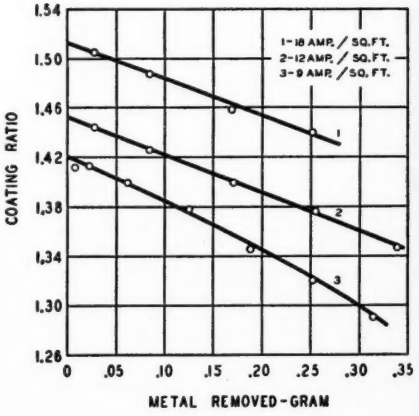

Fig. 4—Chart showing effect of current density on coating ratio for 99.9 per cent aluminum anodically treated in sulfuric acid.
(Illustration courtesy "Industrial and Engineering Chemistry")

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have a tendency to be somewhat rough at the higher current densities.

Time of Treatment and Temperature Effects. Figure 4 also shows that higher coating ratios are obtained with thin coatings than with thick ones. This is additional evidence that coatings which remain in contact with the acid electrolyte are gradually dissolved. The greatest coating ratio should, therefore, be obtained with coatings formed in the shortest time.

The fact was brought out by Mason and Slunder that at elevated temperatures the aluminum oxide coating can be dissolved by the electrolyte at the same rate at which it is formed, which emphasizes the importance of the electrolyte temperature in determining the characteristics of the coating. The anodic oxidation experiments, carried out at different temperatures, showed that the oxide coatings were dissolved at different rates, depending on the temperature of the electrolyte. The weight of the oxide coating, therefore, depends on the balance that is reached between the rate of formation and the rate of solution.

When the maximum rate of solution is reached, the pore walls are tapped and the thickness of the pore walls near the surface is at a minimum. Thus, the maximum thickness of coating has been reached for the specific operating conditions. The temperature of the electrolyte affects the taper of the pore walls. At low temperatures, according to Mason and Slunder, there is only a slight taper; at the higher temperatures, the taper is proportionally greater. The size of the pores at the outer surface increases as the temperature is raised and reaches a maximum size when the rate of solution and the rate of formation are equal. Under these conditions the walls of the pores near the outer surface are likely to break down to form a soft chalky layer. This explains the fact that the

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abrasion resistance of the oxide coating decreases as the temperature of the electrolyte used in its formation is raised. Also, it was pointed out that oxide coatings formed at higher temperatures adsorb dyes more readily.

Other Electrolytes. It was brought out by Mason and Slunder that oxalic acid and mixtures of oxalic acid and sulfuric acid have been used commercially in anodizing aluminum. Experiments carried out along the same line as the above, which used the straight sulfuric acid electrolyte, showed that the coating ratio obtainable with oxalic acid is only a little lower than with sulfuric acid, but the anode current efficiency based on the weight of aluminum removed, was only 92.5 per cent, indicating that 7.5 per cent of the current was consumed in some other electrochemical reaction.

The addition of sulfuric acid to oxalic acid, as the electrolyte for the anodizing operation, was found to raise both the anode current efficiency and "coating-ratio" to approximately the value expected with sulfuric acid alone. The required voltage was lowered considerably. Thus, anodic treatment with the mixture resembles that with sulfuric acid in operating characteristics. However, it was pointed out that the oxalic-sulfuric mixtures may be operated at higher temperatures than sulfuric acid alone without the formation of soft coatings.

Thus, the technique employed in these studies points to the usefulness of the weight-of-coating method for studying the mechanism of anodic oxide coating formation on aluminum alloys, the investigation of new electrolytes, and the accurate determination of the effect of variables in the anodic oxidation procedure.

* * *

Preparation of Base Metal for Gold Plating

IT is generally recognized that copper, brass, nickel, and silver are readily gold plated; however, as a practice, steel is usually first plated with one of the above metals prior to gold plating. In some cases silver-plated hollowware is scratched-brushed wet and then gold plated. It should be remembered that if gold is to be deposited on a buffed surface the base metal involved should be given the usual cleaning treatment prior to gold plating. With certain products solder marks are often covered by an undercoating of copper, brass, or nickel.

Most gold deposits are very thin and under these conditions the color of the undercoat sometimes influences the color of the plated object. It has been pointed out that with a gold deposit 0.000025 mm. (0.000001 in.) or more in thickness, this effect is eliminated; so that where a heavier coating is used, the limitations as to choice of

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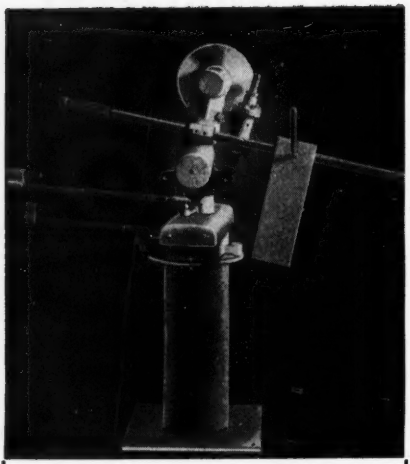

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undercoat are less (see also Weisberg and Graham, "Gold Plating," published in "Modern Electroplating").

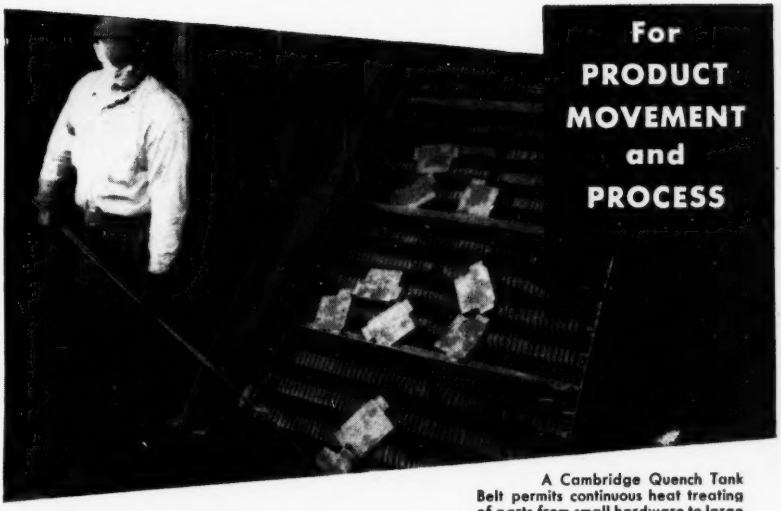
A brass undercoating is sometimes specified because there is less contrast in color if the gold wears through in some places. In many present-day operations where the utmost in wearing qualities is required, the gold plate is protected by a covering of transparent lacquer, which is baked on. All things being equal, a nickel undercoating is usually considered very satisfactory. For example, it has been reported that costume jewelry made of brass or white metal, which was first plated with about 0.0002 inch of bright nickel, then with only enough gold to give the desired color, and finally covered with a good grade of baked transparent lacquer, has been found to stand up well in service.

Special procedures have also been developed for the gold plating of stainless steel, since the passive character of the base metal may require special treatment. Several patents have been issued covering methods requiring electropickling of work in hydrochloric acid solutions or, in another case, a dip in a fluoride mixture. Generally, where these treatments are used it is best that the work be connected to the cathode rod before immersion in the gold plating bath, the composition of which may be altered to suit the conditions of pretreatment.

* * *

Non-Metallic Coatings for the Protection of Steel

A report has recently been made on the behavior of a range of protective non-metallic coatings applied to structural mild steel and exposed to field corrosion tests as part of the investigations conducted by the Protective Coatings Sub-Committee of the British Iron and Steel Research Asso-



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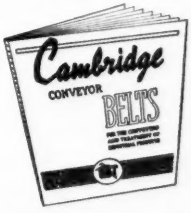

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ciation. (See also the Journal of the Iron and Steel Institute - January 1948.) The protective schemes tested were classed in three groups; namely, paints, sprayed coatings and other coatings. The painting schemes studied included two and four-coat combinations of red lead in linseed oil and red oxide in linseed oil, a proprietory scheme of paints bound with alkyd resin media, and painting schemes incorporating priming coats of resin reinforced lanolin-base paints. These were applied in the laboratory to specimens prepared for painting by a number of different surface treatments.

The sprayed coatings tested comprised a paint with no volatile constituent, prepared for spraying on hot by a special pistol, cement-asbestos as used chiefly for insulation purposes, powdered bitumen mixtures, and a mixture of powdered zinc with a high silica glass, these powdered mixtures being sprayed by a modified form of the powder metal spraying pistol. The other coatings tested were a tar-tallow-lime mixture applied hot, vitreous enamel, and a rubber-wax mixture which could be molded to give a continuous sheath.

The interim conclusions drawn in the report were based on the results of observations over periods of up to 5 years in the case of atmospheric tests, and of two years in the case of the seawater tests. These observations showed that the two coat painting schemes applied to the mild steel specimens pickled by the sulfuric acid-phosphoric acid process, which involves a final dip in 2 per cent phosphoric acid, were in good condition after five years in the atmosphere. According to the details given for this pickling procedure, the steel specimens were descaled by immersion for 15-20 minutes in dilute (5-10 per cent) sulfuric acid at 60-65 deg. C., rinsed by dipping twice into water at 60-65 deg. C. and finally immersed for 3-5 minutes in a bath containing approximately 2 per cent of free phosphoric acid and 0.3-0.5 per cent of iron at a temperature of 85-90 deg. C. On removal from the final bath the specimens dried rapidly, leaving a dull gray film of phosphate on the surface. It was reported that this film, by itself, has only slight protective value, but forms an excellent base for paints.

In contrast to these satisfactory results, bad results were reported when one of these painting schemes was applied to specimens that had been partially descaled by weathering and then wire brushed; in this case, according to the report, failure occurred in 1.6 years or less. Treatment of this type of surface with a proprietory inhibitive wash, containing phosphoric and chromic acids, before painting failed to improve matters.

Lanolin-base paints hardened with synthetic resin, and containing chromate pigments were found to give good

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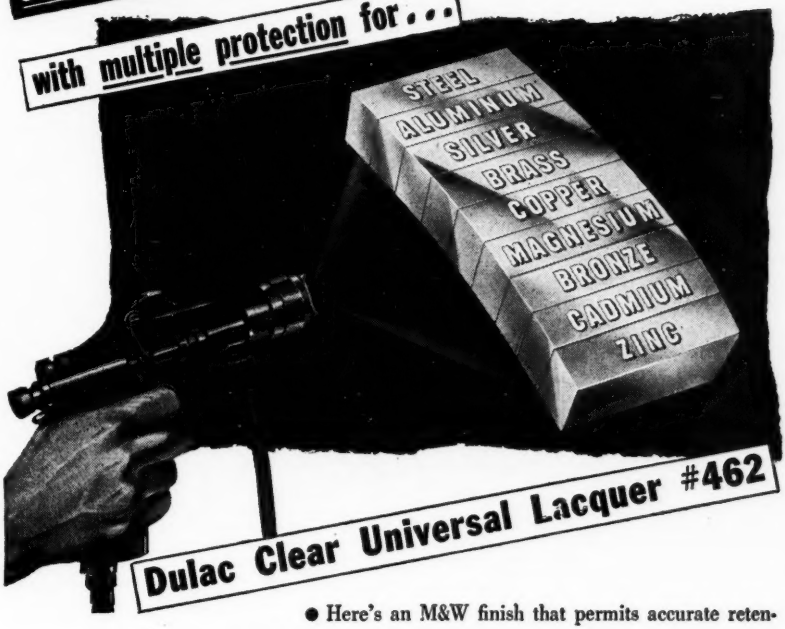

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results as primers over pickled steel in atmospheric tests. It was also reported that a special process whereby a paint containing no volatile matter is sprayed on gave good results in an industrial atmosphere, but showed signs of breakdown after 5 years in a non-industrial atmosphere.

The report also stated that a tartallow-lime mixture, applied hot, failed to protect the steel specimens for more than 3 years in an industrial atmosphere, but this life was comparable with that which would have been obtained from a single paint coat of approximately the same weight. In the case of coatings of sprayed cement-asbestos, ¼ inch thick, no external sign of corrosion of the encased steel was visible after 5 years. Also, it was stated that a rubber-wax sheathing gave good results in an industrial atmosphere, but showed some irregularities in a marine atmosphere.

As regards the vitreous enamel coatings, it was reported that they were in perfect condition, apart from minor mechanical damage, after 5 years in industrial or non-industrial atmospheres, and 2 years in sea water. Heavy coatings of sprayed bitumen, alone or mixed with rubber or zinc, were stated to have shown good results when continuously immersed in sea-water. It was also stated that the addition of glass to zinc coatings, sprayed by the powder pistol, had no appreciable effect upon their performance when continuously immersed in sea-water.

Wetting Agent Bulletin. A four-page bulletin describing PN-700, a chemical water conditioner or wetting agent, has been issued by Service Industries, 2103 E. Somerset St., Philadelphia 34, Pa. The properties of PN-700 are described and industrial applications of the material are suggested. Copy free upon request.

"Belke Rod Agitators for Plating Tanks" is the title of a four-page illustrated bulletin designated as Bulletin 199 and issued by the Belke Manufacturing Co., 947 N. Cicero Ave., Chicago 51, Ill. The bulletin describes rod agitators for electroplating tanks, and outlines the advantages to be gained from their use. Copy free upon request.

"Hercules Products" is the title of a 20-page booklet being distributed by the Hercules Powder Co., Wilmington 99, Del. The booklet classifies the chemicals manufactured by the company into groups according to the type of product and the use of each group. Approximately 100 chemicals are described as to chemical makeup, uses, and potential applications. Copy free upon request.

"Dust Collecting Systems in Metal Industries" is the title of a 24-page illustrated booklet issued by The Kirk & Blum Manufacturing Co., Cincinnati 25, Ohio. The various industrial applications of Kirk & Blum dust collecting equipment are illustrated and described in the booklet, thus presenting a clear picture of the various possible uses of these products. Copy free upon request.

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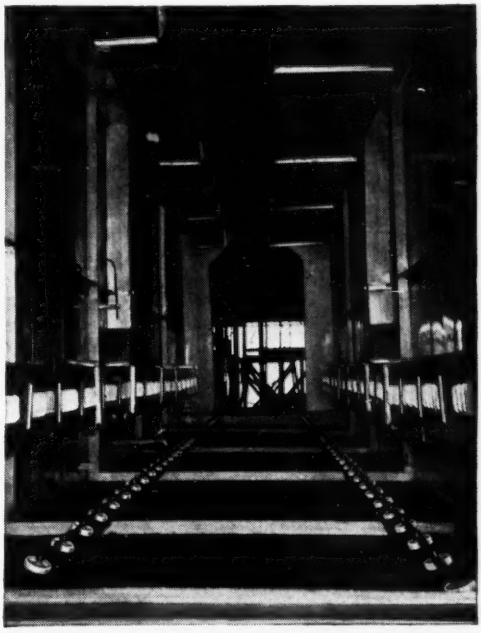

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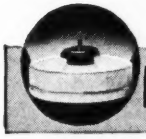

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PRACTICAL APPLICATIONS of Modern Products

Modern Finishing Techniques Boost Production of Tracy "Customized" Kitchens

AT the Tracy Manufacturing Company, Pittsburgh, Pennsylvania, the production of domestic kitchen equipment is fast-paced but efficient, with the standards of careful workmanship and thorough preparation which distinguish all high quality products being maintained at all times. By a harmonious combination of stainless steel with phosphatized white finish mild steel, Tracy has evolved all-steel "Customized" kitchens, unique for their beauty and durability, as well as for their convenience and working efficiency.

The stainless steel, which is fabricated in a series of metal-working operations, embodies physical and chemical properties which provide strength, resistance to acid corrosion, ease of cleaning, and durability. The mild steel used as basic material for the painted cabinets requires special conditioning to increase its corrosion resistance and to improve its paint-bonding properties. Such chemical conditioning at Tracy combines cleaning and phosphate coating and is performed quickly, effectively, and economically in a power spray washer constructed throughout of mild steel. "Duridine," the cleaning and coating chemical, is a product of the American Chemical Paint Company, Ambler, Pennsylvania. The phosphatizing and finishing department was constructed by the Spray-Con Company of Chicago.

The production sequence of cleaning and

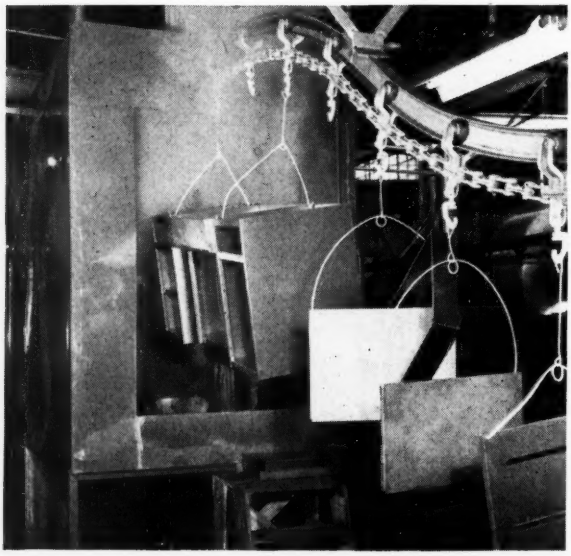


Fig. 1—Sheet steel cabinets and other parts enter the power spray washer in a steady procession. Precleaned by hot water in Stage 1, the work is cleaned and phosphate coated in Stages 2 and 3, rinsed in Stage 4, and rinsed with pH-adjusted water in Stage 5.

Fig. 2—To ensure a perfectly dry phosphate surface and to remove any moisture trapped in corners, this worker air-blows the entire surface with clean dry compressed air just before the phosphate-coated parts pass into the drying oven.

finishing at Tracy begins at the washer entrance, as shown in Fig. 1. Here, heavy gauge sheet steel cabinet frame assemblies, each electrically spot welded into a single unit for maximum strength and rigidity, are suspended on hooks attached to an overhead monorail conveyer. As the assemblies pass through the conditioning tunnel, they are subjected, in succession, to the impingement of cleaning and coating, rinsing and acidulated rinsing sprays in the following order: (1) hot water precleaning spray, (2) hot Duridine spray, (3) hot Duridine spray, (4) cold water rinse, and (5) final hot acidulated rinse.

Relatively free from sludge, the Duridine bath produces on the sheet steel cabinet frames and other cabinet parts a thin, tight, non-metallic, iron phosphate coating of crystalline structure which presents an ideal surface for receiving the white finish and anchoring it firmly. In cases of nicking or chipping which expose the metal, the coating retards the spread of rust under the surrounding finished area.

Compressed air blow-off of excess and trapped moisture, as illustrated in Fig. 2, is followed by hot-air drying of the assemblies over Burdett infra-red principle gas burners at a temperature of 400 deg. F., as shown in Fig. 3. A similar heating system is used for

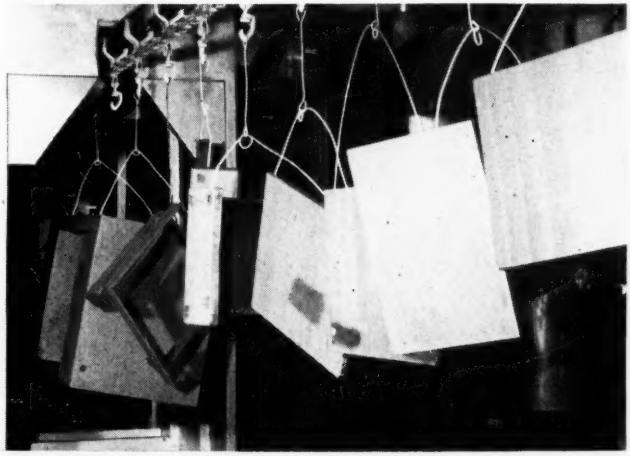


Fig. 3—Cabinet parts leaving the 400-deg. F. drying oven. The conveyor distance from oven to primer paint booth is sufficient to allow the work to cool to room temperature before priming.

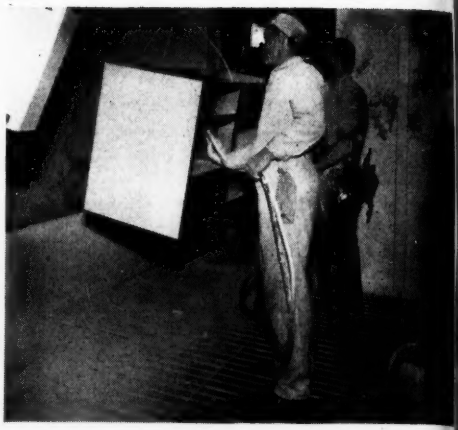


Fig. 4 — Tracy spray painter applying final coat of white finish enamel to underside of cabinet shelf. Thorough overall phosphate coating and two-coat painting provide attractive finish and basis metal protection.

baking the enamel finish for about one hour at a temperature of 290 deg. F. Complete industrial safety is ensured by the use of a Brown Protectoglo Combustion Safeguard flame electrode system which utilizes an electrode placed directly in the flame, thus making the flame part of the electronic circuit. As long as the flame is in operation, the circuit remains closed. If the flame fails, the circuit is immediately opened, the relay is de-energized, and in two seconds the gas flow is stopped.

All surfaces of the phosphatized cabinets, including undersides, are carefully primed and painted with Du Pont Dulux in pressurized paint booths, as shown in Fig. 4. Fresh air pumped in from stations on the plant roof is constantly fed into the booths through felt filters to prevent the ingress of dust and assure an unblemished snowy white finish.

The final operation consists of the assembling of the stainless steel sink to the white cabinet to complete the Tracy Customized kitchen unit, as illustrated in Fig. 5.

All the cleaning, coating, and finishing processes are carried out in a minimum of floor space. The unique layout of the conveyor system and the integrated scheduling of forming and welding operations which permits a steady flow of parts to the conveyor provide the Tracy Manufacturing Company with an efficient production setup to meet the demand for its products.

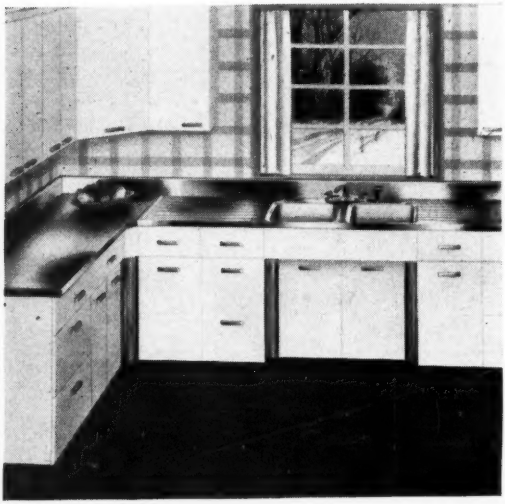
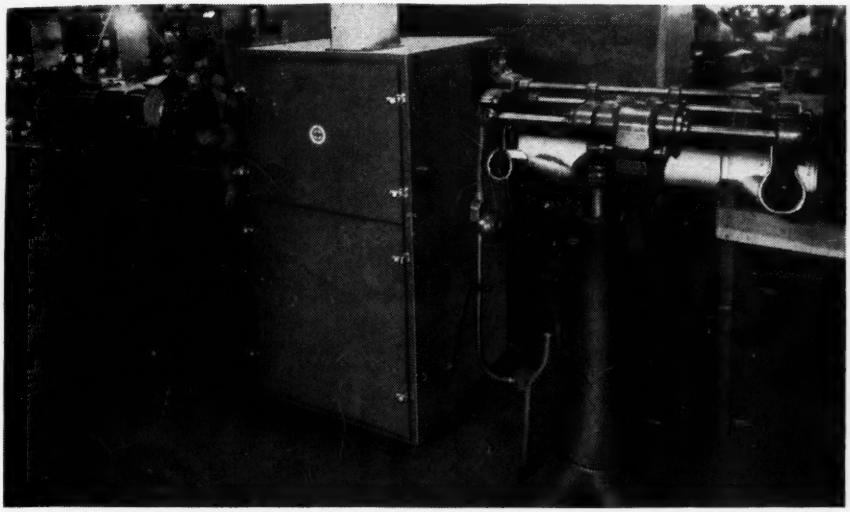


Fig. 5 — The combination of the Tracy stainless steel sink and white finish all steel cabinets provides a household unit of modern design and maximum working ease.

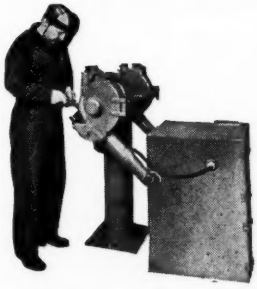
TORIT DUST COLLECTORS



are going "hell-for-leather" in this shoe factory

Dust is one of the by-products of shoe manufacture. In the shaping of soles and heels, and the buffing of finished parts, fine particles of leather, mixed with polishing and dyeing compounds are loosed in large quantities.

Many shoe manufacturers now use TORIT equipment to collect this waste and recirculate the cleaned air. They have found compact, self-contained TORIT Dust Collectors easy to install and thoroughly efficient in operation.



This is one of many installations showing the adaptability of TORIT Dust Collectors to the dust collection problems of different industries. They are available for immediate delivery in models ranging from ⅓ HP to 5HP. For details and the latest TORIT catalog, write:

TORIT MANUFACTURING CO.

314 Walnut Street St. Paul 2, Minn.

Refrigerators Painted Electrostatically at Norge

AT the Muskegon Heights, Michigan plant of the Norge Division, Borg-Warner Corporation, refrigerator cabinets and doors are painted by the electrostatic spray process. Several months ago the Ransburg spray unit was moved from pilot line operation to the main production line. The electrostatic unit automatically applies the first coat to the outside area of the refrigerator cabinet and doors.

The cabinets and doors are carried through the spray booth by an overhead conveyor, as illustrated in Fig. 1. Two cabinets (one per hanger) on 48-inch centers are followed by a work holder designed to hold two sets of provision and machine compartment doors. This permits the alternate painting of cabinets and doors in a way that best lends itself to the subsequent operations. No change or adjustment in the automatic equipment is required to coat both doors and cabinets. The cabinets are inverted to preclude dust settling on the top in the baking operation. The back is not coated in the first coat as this area is largely covered by the "flue" which is subsequently attached.

Spaced 12 inches from the surfaces being painted is the high voltage grid, shown in Fig. 2, which creates the electrostatic field of attraction between itself and the electrically grounded parts. The high voltage equipment and certain special controls were supplied by the Ransburg Electro-Coating Corporation. Among these controls is a new development which the Ransburg Corporation calls "The Electronic Spark Guard," which turns the equipment off in case any breakdown in insulation occurs, or in case a part should inadvertently get so close to the voltage grid as to cause a spark. This device actually turns off the power before the spark occurs and thus adds considerably to the safety of the painting operation.

The entire painting operation is accomplished in one pass through the single booth, employing seven automatic spray guns operated at very low pressures characteristic of the electrostatic process —2 p.s.i. fluid pressure and 18 p.s.i. atomizing air pressure. The

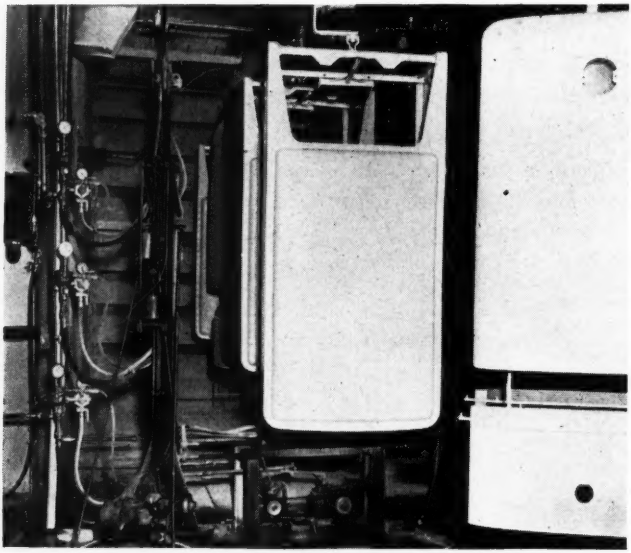
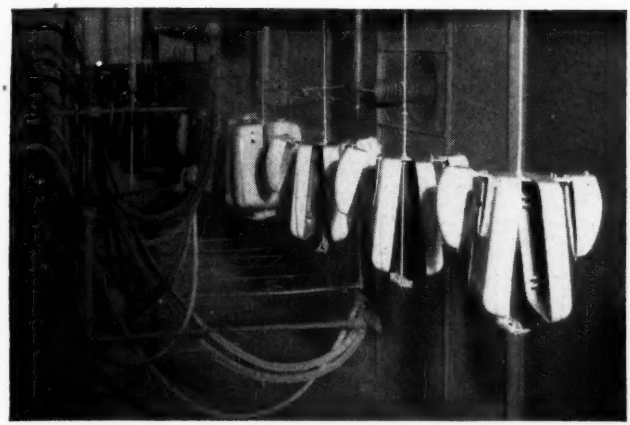


Fig. 1—Overall view of the automatic electrostatic spray installation at the Muskegon Heights, Michigan Norge plant shows how cabinets and doors are hung so that the "wrap-around" action of the electrostatic field attains maximum efficiency.

PUT "Overspray" TO WORK!



For example:

2 cents per housing saved in paint alone on these bathroom scales with automatic Ransburg Electro-Spray.

Overspray is costly waste—in both paint and labor.

When you convert to the Ransburg Electrostatic Spray process, "overspray" is utilized. Paint savings alone average 40 to 60 per cent . . . paint mileage is ordinarily doubled.

That's why Electro-spray is setting production economy records on job after job . . . even in factories which never before could consider completely automatic production painting.

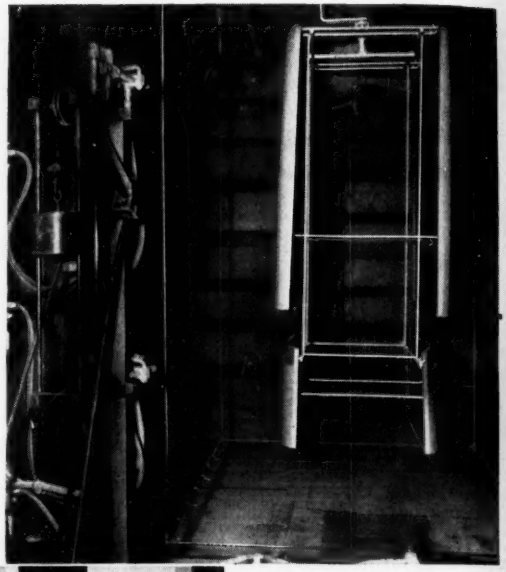
With the possibility of savings like these, why not ask Ransburg engineers to analyze your coating operations.

RANSBURG

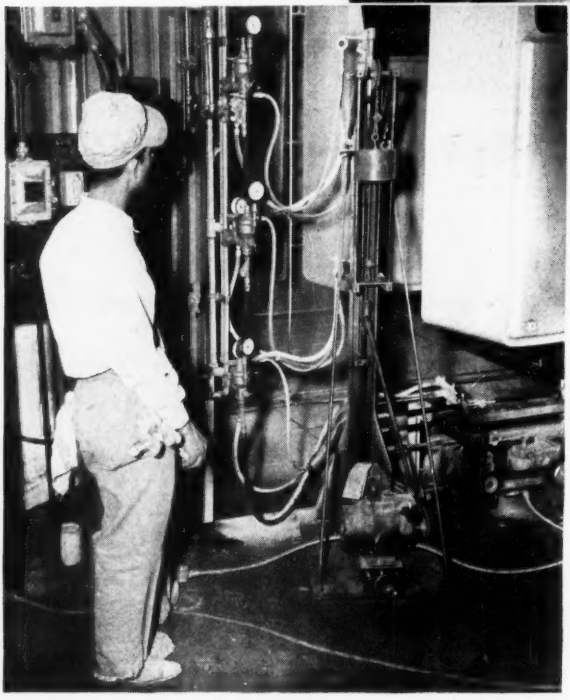
RANSBURG ELECTRO-COATING CORP.

Indianapolis 7, Indiana

Fig. 2—Close-up of the booth showing arrangement of the three-sided Ransburg electrode system



guns move automatically up and down the sides, and back and forth across the inverted top to produce a uniform paint film. This, in itself, is an improvement over the hand spray methods, and holds paint rejects to a minimum. Figure 3 is a view of the spray gun installation. Hand spray is employed for coating the inside of the machine compartment doors and the inside of the machine compartment itself, since these areas are shielded and cannot be coated by electrostatic deposition.



One of the features of the operation is the so-called "wrap around" that is inherent in the Ransburg process. Electrostatic attraction causes the paint to deposit as heavily on the edge masked from the spray as it does on the edge facing the spray. Part of this accomplishment is due to the manner in which the spray guns are turned off and on between parts. Another very helpful result of the "wrap-around" action is the full coating that is accomplished on all edges.

Fig. 3 — Individual pressure regulators provide accurate control of fluid and atomizing pressures at each gun.

Dolan's "Big-4"

No. 1

Synthe-Chrome- A clear water white baking synthetic which provides the closest reproduction of chrome plating on highly buffed white metal die castings. Exceptionally desirable because of Chromic Acid shortage.

No. 2

988-Shop Coat Primer-Quick drying, all-purpose primer. Adaptable to all metal surfaces. Exceptional value.

No. 3

1016-Black Metal Lacquer- Outstanding quality designed for use on Instrument Panels, Control Cases, Switch Boxes, etc.

No. 4

855-Water-Dip Clear- A synthetic protective coating which prevents oxidation and finger printing of all plated surfaces. Instantaneous dry.

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Illustration shows toys being conveyed through gas-fired (infra-red) radiant heat oven. *(Photo courtesy Burdett Manufacturing Co., Chicago, Ill.)*

With previous manual spray the satisfactory coating of the edges was a most expensive operation. If they were not properly coated, there was a possibility of rust starting there and creeping onto exposed surfaces.

This new application of the Ransburg electro-coating processes is making history at Norge in that it forms an outstanding postwar improvement made in the manufacturing facilities. Borg-Warner vision and engineering have made possible an accomplishment that many in the field said could not be done.

Improved Process Control and Increased Production Obtained with Radiant Heat

INCREASED production and a more lustrous finish on metal toys are credited to gas-fired (infra-red) radiant heat by the Structo Manufacturing Co., Freeport, Ill. The baking equipment was designed and built by the Burdett Manufacturing Co., Chicago, Ill. The gas-fired (infra-red) radiant heating oven is said to have made possible an increased production of toys so that 8,000 units can now be finished in each eight-hour day. It is reported that the toys show improved quality and that the colors obtained are brighter. Scratching or marring in final assembly has been reduced to a minimum because the finish obtained shows increased resistance to mechanical damage.

The organic finish is applied to the toys by dipping, draining, and then baking for five minutes at 290 deg. F. on a chain conveyor. The installation has made possible more accurate control over finishing operations with resulting higher quality of product.

NFPA Handbook of Fire Protection. 10th edition. By Crosby, Fiske and Forster. Edited by Robert S. Moulton, National Fire Protection Association, 60 Batterymarch St., Boston 19, Mass. 1,500 pages, 5¼ x 7½ inches. Price, $9.50.

The tenth edition of the NFPA Handbook of Fire Protection presents in compact form for ready reference the essential information on fire prevention and protection that time has crystallized into good practice. The handbook, which covers both life safety from fire and the protection of property, represents a full two-years' work on the part of the National Fire Protection Association staff with the assistance of more than 100 expert consultants.

You can produce on any material the following surface finishes:

FELT - SUEDE LEATHER - MOHAIR VELOUR - VELVET - CARPET

FUNCTIONAL USES

Used in the auto, airplane, radio, electrical, phonograph, ceramics, furniture and many other industries for surfacing all sorts of materials to provide

TEMPERATURE INSULATION • SOUND DEADENING • INTEGRAL GASKETS • SHOCK ABSORBING SURFACE • NON-MAR SURFACE • NON-GLARE SURFACE

DECORATIVE USES

Applied in various lengths and colors to wood, paper, cloth, metal, etc., the following effects are produced—

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with these patented and trademarked Rayco specialties:

FELT AND SUEDE SURFACE

*"Raymix"—a flock of rayon fibres, trademarked under U. S. No. 427949 to produce a suede effect of utmost realism on any surface.

*"Kingcote"—a cotton flock trademarked under U. S. No. 423572, producing a suede effect at minimum cost.

MOHAIR, VELOUR AND VELVET SURFACE

"Raycote"—a flock composed of uniformly cut rayon fibres to produce on any surface a pile effect such as velvet, plush, or velour. Made under U. S. Patent No. 2014947.

SYNTHETIC CARPET

"Harecote"—a flock composed of animal fibres, produces a durable carpet or rug material.

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**Registered Trademark*

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3901 Main St.
Dallas, Texas

Finishes that aid in appearance and utility

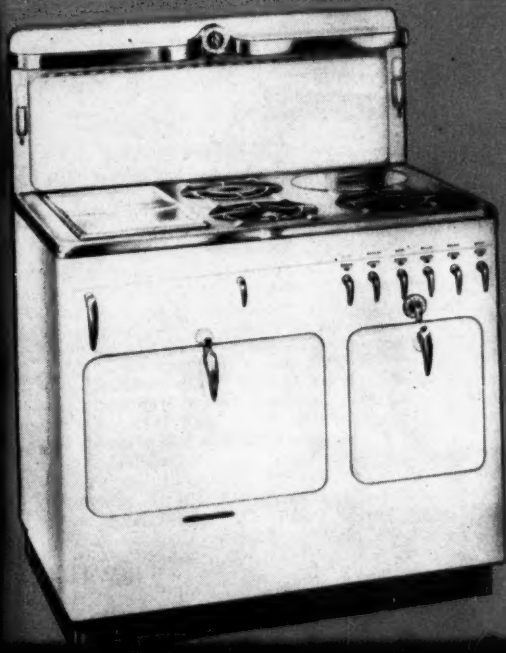
Baked-on white and col
enamel contrasts buffed h
lighted surfaces of some of
compacts pictured herew
On others, contrast is obtai
through stamped or machi
designs and silver and g
plating. A baked-on lac
provides surface protectio
*(Photo courtesy Rex Products C
New Rochelle, N. Y.)*

Manufactured by The Specialty Productions Division of The Dow Chemical Company, the magnesium canoe illustrated herewith is finished in pastel green baked-on enamel with dark green trim.

(Photo courtesy The Dow Chemical Co., Midland, Mich.)

The Audograph Electronic Sound-Writer here illustrated has a die cast aluminum base. The deck is finished with a baked-on primer and a final coat of taupe deck enamel. After drying, the deck is masked and the balance of the instrument case is then finished with gun metal wrinkle finish.

(Photo courtesy Gray Manufacturing Co., Hartford 1, Conn.)



Porcelain enamel and chromium plate combine to provide beauty and utility for the retained-heat gas range pictured herewith. The one-piece cast iron cooking top as well as all the handles and trim strips are chromium plated. The cast aluminum griddle is polished and buffed. Other exterior and interior parts of the range are finished in porcelain enamel.

(Photo courtesy Chambers Corp., Elselbyville, Ind.)

NEWS of the Industry

H-VW-M Promotes Bauer and Norton

John A. Bauer, former sales manager of the Hanson-Van Winkle-Munning Company, Matawan, N. J., has been appointed vice president and sales manager to succeed Louis M. Hague, newly appointed president of the company. Mr. Bauer has been with the company twenty-two years, starting as advertising manager of the former A. P. Munning Company. He later served as manager of the Pittsburgh, Philadelphia, and New York offices, returning to the home office in 1939 as assistant sales manager.

Robert M. Norton (left) John A. Bauer

Robert M. Norton has been appointed assistant sales manager by the Hanson-Van Winkle-Munning Company. Prior to his new assignment, Mr. Norton was engaged in sales promotion activities at Matawan; before that, he served H-VW-M customers in the electroplating and polishing equipment and supply field in the capacity of district manager for New York and New England and field representative in the New York State territory. Before joining the H-VW-M organization in 1940, he was a district sales manager for the Western Union Telegraph Company.

Eastern District Manager Appointed

W. J. Holtmeier, 71 W. 23rd St., New York 10, N. Y., has been appointed Eastern district manager for The Standard Electrical Tool Co., Cincinnati, Ohio.

Mr. Holtmeier will serve the states of Connecticut, Northern New Jersey, Rhode Island, Metropolitan New York, Eastern Pennsylvania, and that strip of New York State that extends from New York City north, including Peekskill, Beacon, Poughkeepsie, Albany, Troy, and Schenectady.

Roberts Rouge Expands Manufacturing and Distribution Facilities

Through the purchase of a substantial interest in The McAleer Manufacturing Co., Ltd., Chatham, Ontario, Canada, the Roberts Rouge Co., Stratford, Conn., can now supply Canadian customers with buffing and finishing compounds. A complete line of Roberts compounds will now be produced at the McAleer plant in Canada, according to an announcement by Theodore F. Onkey, recently elected president of McAleer. Canadian customers, previously hampered by import restrictions, can now purchase Roberts compounds directly from McAleer.

By a reciprocal trade arrangement, the complete McAleer line of polishing, rubbing, and cleaning compounds will be manufactured at the Roberts plant for distribution in the United States.

Marvin J. Udy Honored

The Jury of Award of the Western New York section of the American Chemical Society has awarded the Jacob F. Schoellkofp Medal for 1948 to Marvin J. Udy, internationally known chemist and metallurgist. Among Mr. Udy's better known achievements is the development of the process for cadmium plating, the patents for which formed the basis for the formation of the Udylite Corporation, Detroit. Michigan.

Emmit W. Archer Joins Dow Research Staff

Recently appointed to the staff of The Dow Chemical Co., Midland, Mich., was Emmit W. Archer, who will act as research and development engineer in the magnesium laboratory.

Mr. Archer received his B.S. degree in chemistry from the University of Indiana in 1943. Prior to joining Dow he was connected with The Udylite Corporation, Detroit.

Mitchell Named Clinton Factory Superintendent

Stephen P. Mitchell has resigned as technical director of The James B. Day Company to accept a position as superintendent of The Clinton Co., Chicago, Illinois.

Stephen P. Mitchell

Mr. Mitchell received his B.S. degree from Franklin and Marshall College. He then spent 1½ years as research chemist for The Resinous Products & Chemical Co., Philadelphia, Pa. In 1937 he accepted a position as part-time instructor at Northwestern University and, while teaching at Northwestern, obtained his M.S. degree. He subsequently spent one year as a chemical engineer with the U. S. Gypsum Company and six years as research chemical engineer with the Sherwin-Williams Company.

Heads Sales Staff

L. S. Sternal has joined the Jackson Buff Corp., Long Island City 1, N. Y., as sales manager. His duties will include building a national sales force to adequately service the demand for the company's products.

L. S. Sternal

Mr. Sternal graduated from Carleton College, Minnesota. He later joined the General Electric Company in Schenectady and Bridgeport. Prior to the war, he was a sales engineer for Minnesota Mining and Manufacturing Company, New York Branch. After serving three years in the Navy as an officer on the staff of a destroyer squadron commander, he rejoined Minnesota Mining as a methods engineer.

Mr. Sternal brings to his new position wide experience in the development of processing and technique in the polishing industry.

American Standards Association Safety Code Committee

Increasing emphasis on proper plant ventilation has led to reorganization of the Sectional Committee on Safety Code for Industrial Exhaust and Ventilation, according to an announcement by the American Standards Association, 70 E. 45th St., New York 17, N. Y. Theodore Hatch of the Industrial Hygiene Foundation has been named chairman of the reorganized committee.

The committee is concentrating its effort around specific operations for which exhaust ventilation is needed rather than the development of specifications for the equipment itself. Ten operations have been selected for the basis of future work; namely, mechanical cutting and abrading; surface coating; open tank operations; solid materials handling; fuel-burning exhaust-gas producing operations; molten materials handling; welding, burning, and soldering; fiber handling; and chemical process operations.

District Managers Confer

Turco Products, Inc., 6135 S. Central Ave., Los Angeles 1, Calif., assembled district managers for a two-day home office conference with laboratory technicians and department heads.

The principal theme of the sessions concerned the adaptations and applications of new wetting agents and detergents to the company's line of specialized cleaning compounds. The district managers will in turn convey this information to the members of the field service organizations.

Lupo Research Laboratories Formed

Joseph Lupo has resigned as vice president of Lupomatic Industries, Inc. and is now devoting his time to organizing research and service laboratories in several large industrial centers in the United States and Canada. The laboratories will operate under the name of Lupo Research Laboratories, and will be concerned with the development of tumbling equipment and compounds. The laboratories will have all facilities necessary to process any parts submitted and also to perform any production job test. The first three laboratories are already in operation, one at 3636 Park Avenue, New York City; one at 745 Planfield Street, Providence, Rhode Island; and one at 9 North West Street, Mount Vernon, New York.

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CHROMIC ACID

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COLE LABORATORIES, INC.

23rd Street and 37th Avenue

Long Island City, New York

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Williamsville Buff Becomes Division of The Bullard Clark Company

The consolidation into The Bullard Clark Company of the E. H. Jacobs Manufacturing Company with its three affiliated companies, The E. H. Jacobs Manufacturing Corp., Charlotte, N. C., The Williamsville Buff Manufacturing Co., Danielson, Conn., and Jacobs Rubber Products, Danielson, Conn., has been announced.

The Williamsville Buff Division was organized in 1898 by the Williamsville Cotton Mills of Connecticut, which was purchased by W. Irving Bullard and Frederick A. Jacobs in 1905. The buff business was retained by the Jacobs Company and the cotton mill was re-equipped with tire fabric machinery and sold to the Goodyear Tire and Rubber Co., Akron, Ohio. The buff division uses over one and a half million yards of sheeting per year for the manufacture of buff wheels for polishing metal, and is also a large producer of polishing wheels made of canvas and leather for polishing heavy machinery and hardware.

The parent company was established in 1869 by Edward H. and Frederick A. Jacobs, Danielson, Conn., whose business idealogy was to have management and ownership remain within the family. Today, after 80 years, the third generation assumes control of management and ownership.

The new officers of The Bullard Clark Company are: W. Irving Bullard, chairman of the board of directors; Edward J. Bullard, president and treasurer; B. T. Clark, executive vice president; J. D. Lodge, vice president and secretary; and J. E. Moe, vice president. The division executives are as follows: E. H. Jacobs Northern Division, B. T. Clark, general manager; Williamsville Buff Division, Jack D. Lodge, general manager; Jacobs Rubber Division, J. E. Moe, general manager; and E. H. Jacobs Southern Division, C. W. Cain, Jr., vice president.

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Phosphoric Acid Metal Conditioner

PREPARES METAL FOR PAINTING

- *CLEANS METAL—Removes oil, rust and corrosive agents.*
- *BONDS PAINT—Etches metal and coats with phosphate.*
- *SAFE — Non-inflammable, non-toxic, non-corrosive.*
- *EASILY USED — Liquid applied by brush or dipping; wiped or washed off.*
- *APPROVED—Over 3,000,000 gallons used in last 10 years.*
- *ECONOMICAL — Dilute one volume Sol-Klean with three volumes of water.*

INDUSTRIAL CHEMICAL PRODUCTS CO.

3779 Bellevue Ave.,

DETROIT 7, MICHIGAN

In Canada made and sold by Boyle Chemicals Limited, Windsor, Ontario.

Norton Appointments

Norman V. Crabtree, abrasive engineer for the Norton Co., Worcester 6, Mass., in Lansing, Michigan, has been appointed for the territory centering around Flint, Michigan. He will replace Harland T. Pierpont who is being transferred to Worcester to become sales manager of the company's Refractories Division.

Richard H. Merchant, formerly field engineer in the Detroit area, has been appointed abrasive engineer to take over the district recently covered by Mr. Crabtree.

DeVilbiss Industrial Finishers School

Several comprehensive one - week courses for industrial finishers are included in the DeVilbiss School of Spray Painting curriculum for the second half of 1948. Maintained as a service to all users of DeVilbiss equipment, these tuition-free courses include instruction on spray painting technique and function and care of spray equipment.

Classes, lasting one week each, will begin on July 12, August 9, September 13, October 11, and December 13, with all courses covering the same instruction. Since class size is necessarily limited, it is advisable to write for reservations as early as possible to The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

Appointed Industrial Sales Representative

The appointment of Lawrence M. Muse as assistant to G. L. Hehl, general manager, Industrial Division of The Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland 1, Ohio, has been announced by Mr. Hehl. Mr. Muse will have charge of developing and promoting industrial sales through Sherwin-Williams branches as well as in the general industrial maintenance field.

A native of Nashville, Tennessee, Mr. Muse attended Morgan Preparatory School and in 1936 joined Sherwin-Williams as warehouse stockkeeper at Nashville. Later he was transferred to Chattanooga, Tennessee, in graphic arts and trade sales work.

He served with the armed forces as a bombardier-navigator from 1943 until 1945 when he returned to Chattanooga. In the interim he has served as manager of Sherwin-Williams branches at Johnson City, Tennessee, and Miami Beach, Florida, and for the past year and a half has been assistant to W. B. Bell, director of S-W's southeastern district with headquarters in Atlanta, Ga.

Morrison Awarded Army Contract

The Morrison Engineering Corp., Cleveland, Ohio, has been awarded a contract for 65 electric heat treating furnaces from the Air Material Command of the United States Air Force, according to an announcement by C. R. Sare, president of Morrison.

The furnaces, designed and built by Morrison Engineering, have a temperature range of 250 to 1,850 deg. F. with automatic closing temperature control. Each furnace is insulated with a 10-inch lining of refractory brick and insulating block and has a chain-operated counterweighted door. Morrison heat control furnaces are electrically heated by specially designed nickel chrome resistors.

For Sale
SLIGHTLY USED
BUFFS
Loose and Sewed — Any Quantity — All Sizes.

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SOLVENTS RECOVERED BY
THE LOFGREN PROCESS
We RECOVER YOUR
SOLVENTS and THINNERS
From - Sludge - Waste - Wash - Spoiled Lacquers, etc.
Each customer's shipment, whether one drum or a carload, receives *proper and separate treatment.* Write to:
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PROCESSING CARRIERS

Carefully designed, well-built handling equipment is a "must" in the plant that gears its processing and finishing operations to the almost miraculous new machine tools (a late one, for instance, powered by 40 motors).

Therefore, Rolock designs Carriers for the specific job. Baskets, racks, trays, crates, fixtures, muffles, etc., ruggedly built for endurance . . . for lower handling costs and rejects, fast production. This motorized Monel barrel, for example, carries heavy loads for speedy pickling. Handled by monorail hoist, with side brackets for suspension in tank.

Ask our engineers for practical recommendations for any type of Carrier.

ROLOCK, INC., 1400 KINGS HIGHWAY, FAIRFIELD, CONN.

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CUSTOM-BUILT for Better Work, Easier Handling, Lower Cost

Russell Fancher Joins U. S. Stoneware

Howard Farkas, vice president and general sales manger of The U. S. Stoneware Co., Akron, Ohio, has announced the appointment of Russell C. Fancher as sales representative in the Detroit area. Mr. Fancher will work out of the newly opened U. S. Stoneware Company office at 6432 Cass Avenue, Detroit, Michigan.

Russell Fancher is well-known to the chemical and metal-finishing trades in the Detroit area, and is a member of The American Electroplaters' Society, American Society for Metals, American Chemical Society, and Detroit J. A. C.

Mr. Fancher is a graduate of The Detroit Institute of Technology with a B.S. degree in chemistry. He has taken additional work at Penn State, and Loughborough Technical College, England. Prior to his 1943 enlistment in the U. S. Army, Mr. Fancher worked for several manufacturing organizations in Detroit, both in the chemical and metal-finishing fields. Receiving his discharge from the Combat Engineers in 1946, Mr. Fancher joined the sales organization of Eaton Chemical & Dyestuff Company, Detroit.

CUT DOWN REJECTS
WITH
ORVUS
IN YOUR METAL CLEANING BATHS

You'll find this synthetic detergent effective
—as a wetting agent
—as an emulsifier
—in dispersing lime soaps which might cause poor plating if allowed to deposit on the metal
—in speeding rinsing — minimizing water marks

Write for further information about Orvus to
PROCTER & GAMBLE • Cincinnati 2, Ohio

Ferro Promotes Bruton and Davidson

C. D. Clawson, president, Ferro Enamel Corp., Cleveland, Ohio, has announced the promotion of two company members effective June 1, 1948.

G. L. Bruton has been appointed assistant sales manager of Ferro Enamel Corporation, reporting to Glenn A. Hutt, general sales manager. The other promotion went to E. C. Davidson, who was named manager of the Northern and Central Ohio, Western Pennsylvania, and Northern West Virginia territory.

Mr. Bruton has been with Ferro since 1936. He is a graduate of the ceramic engineering department, University of Illinois. Before joining Ferro, he worked for the Detroit Vapor Stove Division of Borg-Warner Corporation.

Mr. Davidson also came to Ferro in 1936. After graduating from North Carolina State College with the degree of B.S. in ceramic engineering, he held positions with Servel, Inc., Baltimore Enamel & Novelty Company, and Republic Steel Corporation.

Westinghouse Names General Manager of Lamp Sales

Ralph C. Stuart, vice president, has announced the appointment of Russell E. Ebersole as general manager of lamp sales for the Westinghouse Electric Corp., Bloomfield, New Jersey.

Succeeding William J. Massey, who retired after 50 years with the company's Lamp Division, Mr. Ebersole will direct the company's lamp sales activities, including commercial engineering and advertising and sales promotion. Since 1944 he has been in charge of the Lamp Division field sales organization, which operates from 42 district and branch offices throughout the United States.

Joining Westinghouse in 1922 as a lamp salesman touring New York's Hudson Valley communities, Mr. Ebersole advanced to manager of Metropolitan New York sales; assistant manager of the Northeastern district; and manager of the Northwestern district, with headquarters in Chicago. Two years later he moved to Bloomfield to take charge of all district offices.

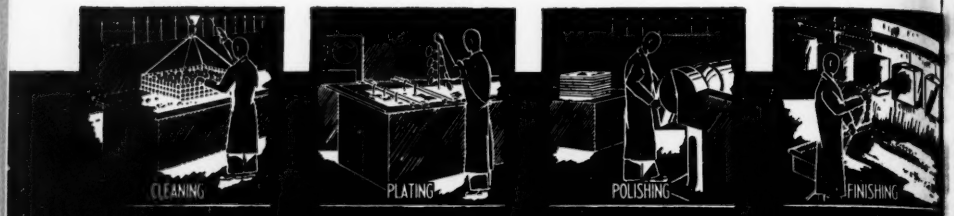
Mr. Ebersole, a native of Nyack, New York, is a member of the Illuminating Engineering Society, the Electrical and Gas Association of New York, and the Electrical Associates Club, New York.

Crack Down on Overhead with Williamsville Buffs

Are all metal finishing needs alike? Not by a long shot! That's why Williamsville buffs and wheels are job-tailored to your particular needs in coloring, cutting, and polishing. They run cool, save compounds, won't ravel, and give the kind of wear that makes cost-conscious management smile with satisfaction.

And no wonder — because Williamsville buffs are made of the highest quality sheeting, carefully cut, turned, stitched, and trimmed. To metal finishers with a weather-eye on competition we offer savings in overhead costs through better buffing. The proof? Consult us now about your requirements. Write, wire, or phone.

WILLIAMSVILLE BUFF DIVISION
The Bullard Clark Company
DANIELSON, CONNECTICUT



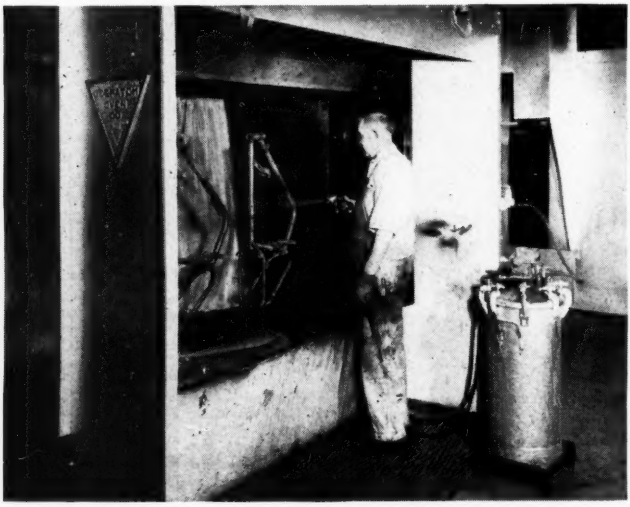
Despatch Water-Wash Spray Booth

A water-wash spray booth designed to remove and clean paint laden air with maximum efficiency has been announced by the Despatch Oven Co., Minneapolis, Minnesota.

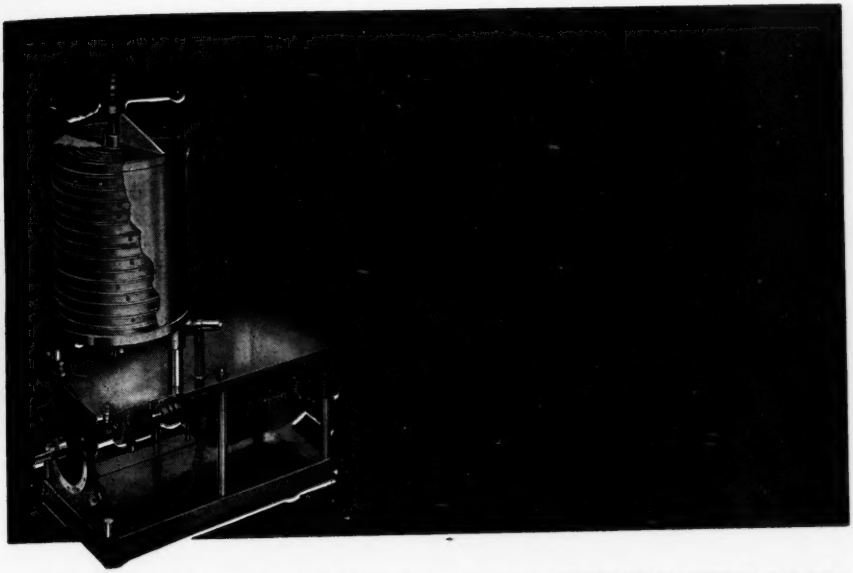
According to the manufacturer, axial flow fans provide a minimum of 150 c.f.m. per square foot face velocity of air for removal of overspray. The air passes upward through a minimum of five water curtains before it is exhausted. The front curtain slopes slightly so that 56 gallons of water per minute may pass down each foot of the length of the curtain without splashing. This volume is said to be far greater than that required to prevent paint build-up on the face of the curtain.

In the eliminator section water curtains are provided by two headers running horizontally and provided with orifices. These orifices shoot the water against a razor sharp divider plate which separates the jets into two curtains of water. These curtains are made doubly effective by baffles which throw the water back across the air passage, thus creating additional curtains, it is claimed.

Moisture eliminating baffles remove excess moisture from the air before it is exhausted. Paint particles are said to be scrubbed so effectively that there is no paint build-up on the interior of the booth even after a long period of operation.



Despatch Water-Wash Spray Booth



The last word in SIMPLICITY *and* ALL 'ROUND EFFICIENCY

HERE'S WHAT IT DOES FOR YOU

You can put an end to costly rejects and reworking once and for all, Sealed-Disc Filters remove all dirt, dust, oil and sludge from your plating solutions and then keeps them bright and clean.

You'll no longer worry about pitting, spotting, poor adhesion, formation of nodules, etc., you'll get more perfectly finished work with a saving of time and labor.

This look inside the "Sealed-Disc" Filter tells the story of the new filtration principle which is responsible for the enormous, filtration area and great capacity in such a small compact unit. This is why "Sealed-Disc" Filters are capable of handling as large a volume of solution as conventional filters many times their size.

For complete details ask for your copy of catalogue P-347.

HERE'S HOW IT WORKS

The liquid flowing into the filter, fills the cylinder and passes into each of the sludge rings, and through the filter discs under and above the rings. The dirt, dust, oil and all impurities are positively held back by the specially constructed discs.

The bright, clean, filtered liquid from each disc enters directly into the perforated screen next to it, runs through the channels in the screen to the common perforated outlet post in the center. Each and every disc used acts as an individual, separate and positive filter.

As the liquid pressure in the filter is equalized all over, except where the discs touch the perforated screens, excess pressure cannot distort the internal parts or cause the liquid to pass through without being filtered. The entire surface and depth of each disc is used effectively to collect impurities and thus prevents surface sealing, and means longer disc life.

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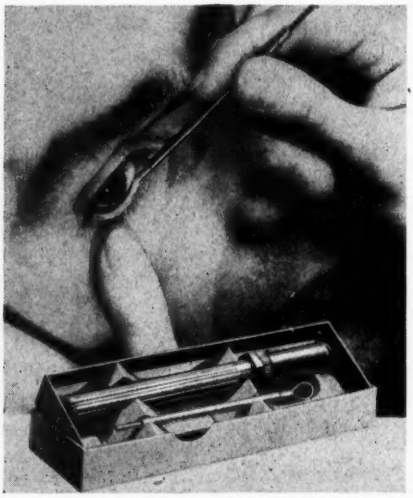
307 Keen Street • Milldale, Conn.

General Scientific Eye Sweep

A handy, convenient instrument for clinic, hospital, and physicians' office has been announced by the General Scientific



General Scientific Eye Sweep

Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa. Designated as the General Scientific Eye Sweep, the instrument is especially designed for the removal of foreign bodies from workers' eyes.

One end of the sweep is fitted with a magnet to facilitate the removal of steel splinters while the other end is fitted with a flexible loop for removing cinders, dust, and other particles. Sterilization of the instrument will not diminish the magnetic qualities nor affect the loop, it is claimed. A hard rubber case is furnished to provide a convenient method of carrying the eye sweep.

Solubar Buffing Compositions

Designed and developed to be easily removable in cleaning operations prior to electroplating, Solubar soluble lime buffing compositions have been announced by the Apley N. Austin Co., 75 Federal St., Boston 10, Massachusetts.

According to the manufacturer, Solubar compounds are particularly helpful to those electroplaters who must use a lime buffing composition and then subsequently plate on the buffed surface. The compounds can be used to advantage by jewelry manufacturers and electroplaters.

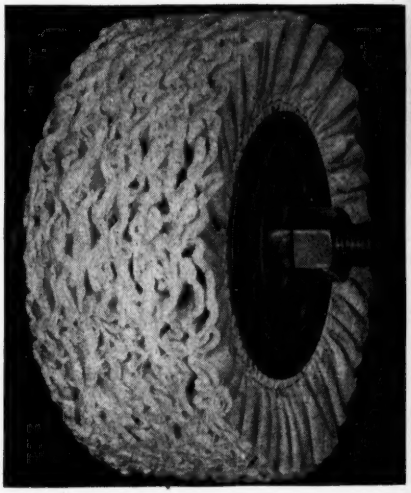
Solubar compositions are available in tripolies, lime, cut and color, chrome rouge, and red rouge types.

Jackson Airway Contact Wheel

A new Airway ventilated contact wheel for abrasive belt polishing has been announced by the Jackson Buff Corp., 21-03 41st Ave., Long Island City 1, N. Y. This new contact wheel has been designed for contour or flat work on stainless or carbon steel stampings, aluminum, brass, die castings, and forgings.

The manufacturer claims that the wheel possesses maximum resilience, yielding readily to pressure yet springing back into shape quickly for the next pass. High speed contour polishing of metals, plastics, or wood is said to be readily accomplished with the ventilated contact wheel.

The Jackson Airway Ventilated Contact Wheel is available in diameters ranging from 6 to 16 inches and in standard sections of ½-inch face. Total width of the wheel face may be adjusted according to the requirements of the particular operation in question.



Jackson Airway Contact Wheel

Little Washers Do Big Jobs

CABINET TYPE AND MANUALLY OPERATED METAL PARTS WASHERS IDEAL FOR SMALL SHOPS AND INTER-DEPARTMENTAL USE . . .

Powerful Manually Operated Parts Washer

Illustrated are two Small METAL-WASH Spray Type Washers, especially designed for shops and departments where a large variety of metal parts must be cleaned in small volume lots.

They are equipped with powerful pumps and high pressure sprays which quickly strip off all dirt, oil, grease or plating solutions. Each in a compact unit, easy to use, economical to operate.

We manufacture a complete line of metal cleaning, pickling and drying equipment. Write today for further information.

Cabinet type Washer and Rinser

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GUNK P-96 THE ORIGINAL SOLVENT
SELF-EMULSIFYING AND SELF-SCOURING

Gunk Concentrate when diluted with 5 to 10 volumes of low cost petroleum distillate or kerosene yields a highly effective self-emulsifying and self-scouring solvent . . . forms powerful oil and water emulsions. These emulsions quickly pick up and remove smut and abrasive particles as well as dirt and oil which disappear when rinsed with water in a safe, milky solution which neither clogs drains nor presents a fire hazard.

- **DEWAXING**
- **DEGREASER**
- **PREPAINT**
- **DEOILING**

U.S. Patent Number 2,107,288 — Exclusive double-barrelled detergency.
NOTE: Sold by industrial jobbers everywhere . . . . if your jobber is out of stock the Curran Corporation will ship *prepaid.*

CURRAN CORP., Lawrence, Mass., Mfg. Chemists

Kidde "L" Type Multi-Jet Nozzle

Designed for smothering dip tank and drainboard fires with carbon dioxide gas, an "L" type multi-jet nozzle has been announced by Walter Kidde & Co., 1020 Main St., Belleville, New Jersey.

According to the manufacturer, the "L" Type Multi-Jet Nozzle will emit fire killing carbon dioxide in a fan shaped blanket which covers the liquid surface in tanks or along drainboards. Equipped with a mounting flange for easy attachment to the top reinforcing angle with which most tanks are equipped, the nozzle is so designed as to permit installation of inlet piping close to tank sides.

Because of the flat fan shaped pattern of the carbon dioxide gas discharge emitted by the nozzle, more complete protection of liquid tank surfaces can be achieved with fewer nozzles and less piping, it is claimed.

Ceilcote Spray Grade

An acid and alkali-proof lining material for fume-carrying ducts has been announced by the Ceilcote Co., Cleveland, Ohio.

The product, known as Ceilcote Spray Grade, has been under test for a number of years by several of the country's largest electrical manufacturers with satisfactory results, it is claimed.

According to the manufacturer, the material is proof against acids and alkalis and has a maximum temperature resistance of 300 deg. F. It has excellent bond strength when applied to either wood or metal. Application is by special spray equipment which builds a lining up to ⅛-inch thickness, affording expansion and absorption and eliminating cracking from vibration.

Ceilcote Spray Grade will be applied by the Ceilcote Company, or may be sprayed on by the user.

"Liqui-Plate" Metallic Finish

A baked aluminum mono-lacquer, designated as "Liqui-Plate," has been announced by The Multi-Coat Corp., 36 Bedford Glenns Rd., Bedford, Ohio.

According to the manufacturer, Liqui-Plate has been designed to provide an

A Strippable Plastic for the Protection of Metals

Striplastic is a protective plastic applied by spraying, dipping or rolling. It is used on stainless steels, high polished metal sheets, sheets in cold working or drawing, tools, dies and parts, and on sheets or metal parts before packaging. It protects against scratching and abrasion, and against rust.

THE

Among many advantages, it is nontoxic, possesses great tensile strength and is easily stripped off in one piece. Write for complete information on this new strippable plastic.

COMPANY
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economical bright durable protective finish on machinery, small tools, heavy metal production parts, wheel rims, steel wall panels, household equipment, and store fronts. It is claimed that the material can be applied to any clean ferrous surface successfully whether or not such surface has been previously phosphatized.

Liqui-Plate may be applied by spray or dip methods or flow-coating and roller-coating. When sprayed or dipped, it is recommended that the lacquer be reduced 10 per cent with xylol, toluol, or lacquer thinner. Flow-coating and roller-coating may be accomplished without reduction, it is claimed.

Liqui-Plate is available in various forms to make possible its use in any special temperature or time cycle whether baking is accomplished by infra-red or by atmosphere ovens.

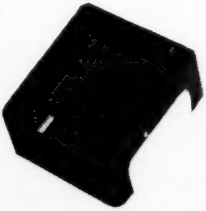
Tacky-Cloth

Tacky-cloth used for removing dust and lint from surfaces prior to the application of a finish is now available in 150 and 250-yard rolls and is being distributed by the George E. Watson Co., 164 W. Lake St., Chicago, Ill. The rolls of Tacky-Cloth consists of 36-inch wide impregnated cloth folded to a 4-ply 9-inch width and rolled upon a 1½-inch cardboard core. The material may be unrolled and cut according to the size desired in the finishing room.

Tacky-Cloth is said to be spontaneous combustion proof, a property which reduces finishing room fire hazards. Each Tacky-Cloth roll is wrapped in greaseproof paper and shipped in an individual carton. The shipping carton may be used as a protective hood. It is not necessary to rewrap Tacky-Cloth when it is not being used since it will not dry out when exposed to air, it is claimed.

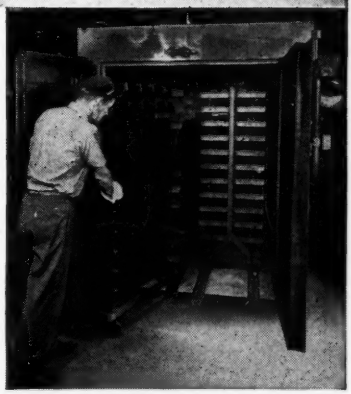
Cooper Model DO-18 Electric Oven

An electric oven designed for laboratory and general chemical work involving baking, drying, and preheating has been announced by the D. C. Cooper Co., 1457 S. Michigan Ave., Chicago 5, Ill. Designated as Model DO-18, the oven finds ready application in metal finishing laboratories by reason of its size and design features.



FAST FINISH BAKING

Refinished Relay Covers and other Control Parts Formerly Air Dried in 8 Hours—Now a Better Wrinkle Finish is Baked in ONE HOUR with the



Despatch R. S. FINISH BAKING OVENS

Minneapolis-Honeywell Regulator Co. uses the above Despatch R S Oven for refinishing of controls sent in for repair. The black wrinkle enamel on the relay cover shown is baked to an extremely hard, durable finish in 1 hour at 300° F. saving 7 hours of former air drying time! Other parts are baked ½ hour at 350° F. This fast baking of finishes speeds up the entire repair program, improves service to customers.

Despatch R S Ovens are well insulated, very economical, 100% controlled for uniform heat up to 500° F., with temperature variation seldom more than 3° ± F. Built in a range of sizes for a great variety of applications. Tell us your needs—

DESPATCH OVEN CO. Established in 1902

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Manufacturers of ovens for: Paint Finishing, Dehydrating, Curing, All Industrial and Laboratory Applications.

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NO RECLEANING

LUSTERBRIGHT

This bright nickel process produces brilliant, lustrous, adherent nickel deposits that may be chromium plated. Merely add LUSTREBRIGHT to your present cold or lukewarm nickel solution. Work comes from plating tanks or mechanical barrels bright and shiny. No special solution or change in equipment necessary. Write for information.

W. C. BRATE COMPANY

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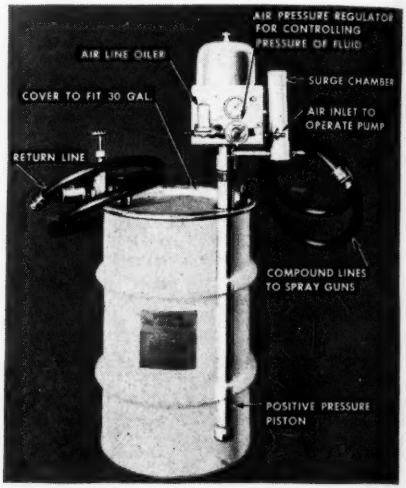
Siefen Circulating Pump

An air-operated positive pressure pump to be used for circulating buffing and polishing compounds has been announced by the J. J. Siefen Co., 5657 Lauderdale, Detroit, Mich. The pump has been designed for use in connection with the spraying of Siefen buffing and polishing compounds on buffing and polishing wheels.


AIR PRESSURE REGULATOR FOR CONTROLLING PRESSURE OF FLUID
AIR LINE OILER
SURGE CHAMBER
COVER TO FIT 30 GAL.
AIR INLET TO OPERATE PUMP
RETURN LINE
COMPOUND LINES TO SPRAY GUNS
POSITIVE PRESSURE PISTON

Siefen Circulating Pump

The pump furnishes compound to the spray guns in addition to circulating the unused compound and returning it to the drum. This arrangement is said to ensure that sufficient compound will be available at all times at each gun and the compound in the drum will be properly mixed so as to be available for use.

According to the manufacturer, the combination of the circulating pump with the spraying of buffing and polishing compounds increases the efficiency of the system.

Mico Silicone-Base Heat-Resistant Aluminum

A silicone-base heat-resistant aluminum finish designated as Mico Aluminum has been announced by the Midland In-

dustrial Finishes Co., Waukegan, Illinois.

According to the manufacturer, Mico Aluminum will withstand temperatures up to 1,000 deg. F. over protracted periods of time without surface breakdown. The properties of the silicone finish are said to be due to the fact that it is similar in structure to the mineral silicates. The finish is claimed to be characterized by temperature stability, inertness, and resistance to water damage. Adhesion and film stability are said to be retained up to the extreme temperature limit of the material.

A chemically clean surface, obtained by any conventional manner of cleaning, is said to be the only requirement prerequisite to the securing of a satisfactory Mico Aluminum finish.

Cambridge Twistex Belt

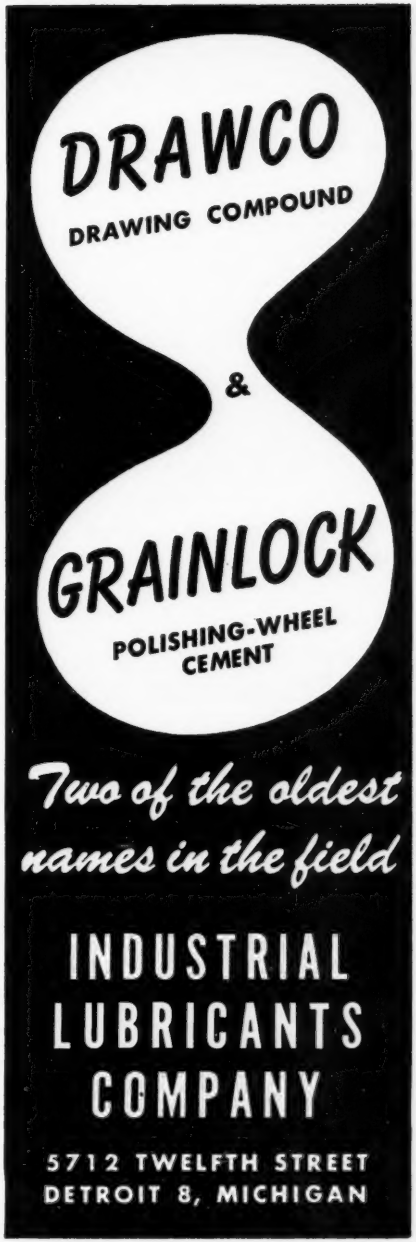
Cambridge Twistex woven wire conveyor belt has been especially designed by the Cambridge Wire Cloth Co., Cambridge, Md., to permit continuous movement of work through industrial washing, drying, treating, or cooling machines using low or high temperature processes.

Cambridge Twistex belt is designed to combine maximum belt strength with maximum open area. The mesh size can be controlled in the manufacturing process to provide up to 87 per cent open area, while the coiled construction utilizes the maximum strength of the metal from which the belt is made, it is claimed. These large openings are said to be extremely useful in industrial washing machines, as wash water or spray can be directed from above or below the belt and passes freely over the work, draining readily back into the wash tank. The Cambridge Twistex Belt requires little maintenance and practically no control because of its specialized metal construction, it is claimed.

The belt can be manufactured from any metal or alloy, to a wide variety of meshes (openings), and for sprocket or roller drive.

Wheel King Polishing Wheel Cement

Maximum flexibility, combined with excellent adhesive strength, is claimed for a new polishing wheel cement called Wheel King, produced by Wallace A. Erickson & Co., 842 N. Wells St., Chicago 10, Illinois.



According to the manufacturer, Wheel King minimizes the tendency of polishing wheels to drag or glaze, and makes possible increased production and improved quality of finish. It is claimed that Wheel King can be used with equal success in conjunction with a wide range of grain sizes, and on wheels or belts.

Wheel King is manufactured in one form only for use with all grain sizes up to 240. It is shipped ready-to-use and is applied cold. To a large extent, the same consistency is used for all grain sizes.

Perma-Skin Underprimer

A quick-drying anti-corrosive underprimer, designated as Perma-Skin, that combines metal surface treatment with high anchorage of top coats and excellent adhesion to a variety of surfaces, such as cold rolled steel, aluminum, nickel, copper, and stainless steel, has been announced by Dennis Chemical Co., 2701 Papin St., St. Louis, Mo. Although Perma-Skin Underprimer is an air-drying material, adhesion in most instances is excellent, it is claimed. On ferrous surfaces corrosion is said to be inhibited by phosphatization and action of the contained pigments, resulting in a strong bond and protection against underfilm corrosion. The underprimer can be used with practically all conventional finishing materials, such as oleoresinous paints, alkyds, baking enamels, and lacquer.

Where maximum chemical resistance is required, a complete Perma-Skin three-coat vinyl system is recommended. For maximum resistance to salt water corrosion No. 2901 Perma-Skin Underprimer should be used. For fresh water immersion No. 2900 Perma-Skin Underprimer is recommended. The vinyl top coats are specially formulated to weld to the underprimers, it is claimed.

ALLWOOD

"Vienna Brand" Lime

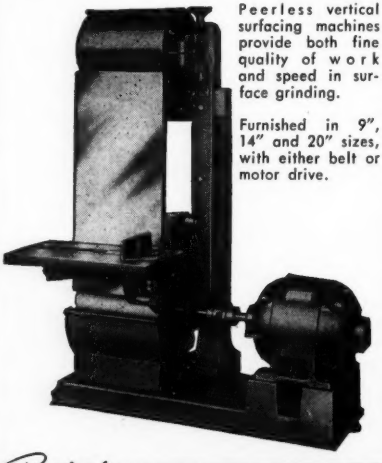
Made from Limestone that is identical in chemical analysis and geological structure with European Imported Lime. Tests show a "lime cake" made from Allwood "Vienna Brand" Lime equals the finish made from imported lime.

WRITE FOR FULL PARTICULARS

ALLWOOD LIME COMPANY

Manitowoc • Wisconsin

PEERLESS VERTICAL ABRASIVE BELT SURFACER



Peerless vertical surfacing machines provide both fine quality of work and speed in surface grinding.

Furnished in 9", 14" and 20" sizes, with either belt or motor drive.

Production MACHINE COMPANY GREENFIELD MASSACHUSETTS U.S.A.

GOLD PLATING SOLUTIONS

In All Colors

Guaranteed 100% Pure Gold Content

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Custom Tailored Finishes TO FIT YOUR REQUIREMENTS

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222 FORTIETH ST. BROOKLYN 32, N.Y.

Improved Anodizing and Coloring Technique

An improved technique for anodizing and coloring rivets, screws, and similar small items has been announced by the Technical Processes Division, Colonial Alloys Co., Ridge Avenue & Crawford Street, Philadelphia 29, Pennsylvania.

The method is said to be characterized by uniform anodizing and coloring, few if any rejects, and the absence of spots or contact marks on the rivet heads. Where the heads of the rivets must be bright as well as where the heads are colored by dyes, this method is said to be of particular interest and value. It is claimed that the method may be used in combination with chemical-polishing. Items to be anodized may be subjected for a few seconds to the chemical (non-electrolytic) polishing bath, during which burrs and rough surface conditions are usually removed, and the objects being polished take on a brilliant appearance. This appearance is said to be preserved in the subsequent anodizing operation performed according to the new method.

The protective coating produced is said to be hard, abrasion and corrosion-resistant, and of value as a decorative finish particularly when dyed.

"Commercial Standard for Porcelain Enameled Steel Utensils" is the title of bulletin CS100-47, as revised, issued by the Commodity Standards Division of the National Bureau of Standards and available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at a price of 10 cents each. The standard lists suggested physical and chemical requirements to be met by porcelain enameled utensils.

For a real good polishing job use

Keystone TURKISH Emery

FRESH SUPPLY AVAILABLE

KEYSTONE EMERY MILLS *Write for Sample* 4316 Paul St., Phila., Pa.

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COLD STRIPPERS

Fast! Economical! Safe! New!

"UNISOL"—For removing all baked enamels! Used cold — Non-inflammable — Non toxic — Strips baked enamels in seconds — Used for all type metals — Requires no rinse — Non injurious to hands or clothing.

"UNISOL No. 2"—A new cold stripper for japans and vinyls—Non inflammable—Strips tough japans and vinyls in matter of minutes—Used for all type metals.

"STRIPPER 202"—Something new for removing "stop-off" lacquers in seconds—Will not tarnish highly polished metal surfaces—Non inflammable—Used cold—Non toxic.

Samples and further information supplied on request.

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The Finishing Touch — **By J. A. Patterson**

"Miss Potts here thinks she would fit into your department, Sneed, she just graduated from Finishing School."